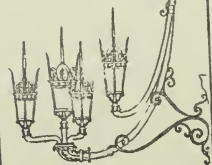


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1976

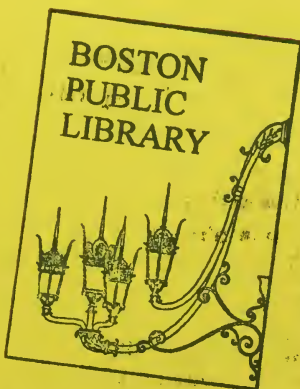


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CHARLESTOWN NAVY YARD - BIRD'S EYE VIEW OF SITE 1960

INTRODUCTION

This document is a Final Environmental Impact Report evaluating the environmental consequences of an amendment to the Charlestown Urban Renewal Plan to implement a proposed mixed-use development program for the reuse of the Charlestown Navy Yard in the Charlestown district of the City of Boston. It has been prepared in accordance with the recommendations of the Secretary of Environmental Affairs, as presented in her "Statement of Secretary on Environmental Assessment Form" of September 13, 1976, and follows the suggested basic outline prepared by the Secretary and attached to the Statement.

This Impact Report has been prepared by staff of the Boston Redevelopment Authority, as lead agency, with the further input from the several State agencies who presently are, or potentially may be, involved in the redevelopment of the Charlestown Navy Yard. These agencies include the (1) Office of State Planning, (2) Department of Community Affairs, (3) Massachusetts Government Land Bank, (4) Department of Environmental Quality Engineering, and (5) Division of Conservation Services.

In completing this report, extensive use has been made of existing planning reports and other documents prepared both by and for the Boston Redevelopment Authority, which are more specifically identified in the Bibliography and, where appropriate, within the body of this Report. Existing data were used to the maximum extent possible, and only minimal independent field research was undertaken.

Part I

ENVIRONMENTAL ASSESSMENT FORM

ENVIRONMENTAL ASSESSMENT FORM

and Environmental Assessment Form Manual
before filling out this form.

ANY

ACTIVITY FINDING

Negative Assessment
Positive Assessment

0

Enter Code

EOEA File No.

Enter Publication Date:

ACTIVITY IDENTIFICATION

Submitting Agency - Executive Office:

Community

Department: Affairs Bureau:

Other: Boston Redevelopment Authority

Activity Identification: Urban Renewal Plan Amendment

Has this activity been filed with EOEA before? Yes ☒ No

If so, under what EOEA number?

Does this activity fall under jurisdiction of NEPA? Yes ☒ No

If so, under which federal agency?

Present status?

ACTIVITY DESCRIPTION SUMMARY

1. Town, County Region, etc.: Charlestown, Boston

035

Enter Code

2. Location within Town or Street Address (if applicable):

Charlestown Navy Yard

3. Activity Type(s): Boundary Change to Charlestown Urban Renewal Area

Planning and Coordinating Disposition and Reuse of Charlestown Navy Yard.

4. Agency Involvement:

5. Estimated Commencement: July 1976

Month

Day

Year

6. Completion: Indefinite

Month

Day

Year

7. Estimated Construction Cost: N/A

8. Estimated Operational Cost Per Year: N/A

9. Summary of Proposal (narrative):

The purpose of the proposed project is to change the Charlestown Urban Renewal Area Project boundaries to include the Charlestown Navy Yard in order that the Boston Redevelopment Authority may effectively participate in the disposition by the federal government of surplus property in the Navy Yard in a manner designed to assure a comprehensive redevelopment of the area which is compatible with local needs and is sensitive to historical, architectural, recreational and environmental considerations.

(See Attachment 1 for text of Urban Renewal Plan Amendment.)

Include an original 8 1/2 x 11 section of a U.S.G.S. 7 1/2 minute, 1:24,000 scale map with the activity or project area boundaries delineated. (Original U.S.G.S. sheet required for filing with Secretary only; copies may be supplied to others.) Include multiple maps if activity or project is larger than the area delineated on a U.S.G.S. 1:24,000 scale map. Include maps, diagrams or sketches at a larger scale if the features of the activity or project cannot be clearly shown at the 1:24,000 scale.

1. Developed		8	9	1
--------------	--	---	---	---

1. Developed		8	9	1
--------------	--	---	---	---

2. Open Space

--	--	--	--

3. Wetland

--	--	--	--

2. Open Space

--	--	--	--

4. Shoreline

4	7.6
---	-----

5. Abandoned Charlestown Naval Shipyard which includes 2 dry docks, 9 piers, and 48 major buildings formerly used in ship repair.

• Give a brief description of the proposed activity, including all phases and characteristics, in 2.

1. Fill in the following dimensions, if applicable:

a. Total Activity Area (Acres):

1	3	6	7
---	---	---	---

d. Number of Stories:

--	--

b. Length in Miles:

--	--	--

e. Number of Parking Spaces:

--	--	--	--	--

c. Number of Housing Units:

--	--	--	--

f. Vehicular Traffic Generated Per Day:

--	--	--	--	--	--	--

2. Change in Urban Renewal Project boundary to include Charlestown Naval Shipyard adoption of land use and development controls.

D. Describe how your agency is involved in the activity in 4.

Specify:

Urban Renewal

1. Permit or Program Type:

2. Pertinent Governing Statute(s) or Regulation(s): M G L C H 1 2 1 B

3. Other State Agencies Involved:

4. The Boston Redevelopment Authority is including the Charlestown Navy Shipyard within the boundaries of the Charlestown Urban Renewal Area in order to effectively participate in the disposition by the federal government of surplus property in the Charlestown Navy Yard.

III. ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACT

Answer the following questions by placing an "X" in the appropriate YES/NO space; consider activity, construction, operational, as well as indirect impacts.

Indicate under "Explanation" why significant impact is considered likely or unlikely to result.

A. OPEN SPACE AND RECREATION

1. Might the activity affect the condition, use or access to any open space and/or recreation area?

NO ☐ X YES ☒

If YES, specify area(s) and acreage(s) affected:

(1) USS Constitution National Historic Site

(2) _____

(3) _____

(4) _____

(5) _____

1	2	7

Acreage

4

Duration

3	6

Severity

1	0	1

Enter Code

2. Explanation: The proposed boundary change will enable the Boston Redevelopment Authority to gain more control in implementing reuse plans for the Navy Yard. These plans may stimulate the creation of open space and recreational facilities in the project area in the future. The proposed boundary change will not affect or prevent access to the National Historic Site.

B. HISTORIC RESOURCES

1. Might any site or structure of historic significance be affected?

NO ☐ X YES ☒

If YES, state level of historic significance:

1

Significance

4

Duration

3 6

Severity

2. Might any known archaeological site be affected by the activity?

X NO ☐ YES ☐

If YES, specify duration and severity:

Duration

Severity

3. Might any known paleontologic site be affected by the activity?

X NO ☐ YES ☐

If YES, specify duration and severity:

Duration

Severity

4. Explanation: The Charlestown Navy Yard is a National Landmark. The Proposed boundary change is intended to give the Boston Redevelopment Authority more control over redevelopment of the Navy Yard in order to retain and protect items of historical and architectural significance through design controls. The proposed planning and development program which the boundary change would help implement has been reviewed by the State Historic Preservation Officer (See Attachment

C. ECOLOGICAL EFFECTS

1. Might the activity affect any natural feature adjacent to or near the activity area?

If YES, specify natural features affected:

- (1) _____
 (2) _____
 (3) _____
 (4) _____
 (5) _____
 (6) _____

X NO YES

Duration Severity Enter Code

2. Might the activity affect wildlife or fisheries?

If YES, specify wildlife or fisheries affected:

- (1) _____
 (2) _____
 (3) _____
 (4) _____

X NO YES

Duration Severity Enter Code

If YES, specify whether any rare or endangered wildlife or fisheries species might be affected:

NO YES

3. Might the activity affect natural vegetation?

If YES, specify vegetation and acreage(s) affected:

- (1) _____
 (2) _____
 (3) _____
 (4) _____
 (5) _____
 (6) _____

Acreage

X NO YES

Duration Severity Enter Code

If YES, specify whether any rare or endangered plant species might be affected:

NO YES

4. Explanation: The proposed boundary change is intended to protect natural features during future development by enabling the Boston Redevelopment Authority to establish controls and guidelines for building and utility construction.

D. ENVIRONMENTAL HAZARDS

1. Might the activity involve the use, storage, release of, or disposal of potentially hazardous substances?

If YES, specify substance type and rate of usage:

- (1) _____
 (2) _____
 (3) _____

Usage Rate

X NO YES

Duration Severity Enter Code

2. Might the activity involve alteration of riverine floodplains, inland wetlands, or coastal wetlands?

If YES, specify duration and severity of impact:

X NO YES

3. Might the activity involve construction or other action within geologically unstable areas?

X NO YES

4. Explanation: The proposed activity does not involve any potentially hazardous substances, nor does it involve the alteration of any wetlands or construction within a geologically unstable area. However, portions of the addition to the Urban Renewal Area do include coastal shoreline, water areas, and flood hazard areas.

E. RESOURCE CONSERVATION AND USE

1. Might the activity affect or eliminate land suitable for agricultural or timber production?

X NO YES

If YES, specify present agricultural land use and respective acreage(s) affected:

- (1) _____
(2) _____
(3) _____

Acreage

Duration

Severity

Enter Code

2. Might the activity affect potential use or extraction of an indispensable or scarce mineral or energy resource?

X NO YES

If YES, specify resource affected and approximate amount:

- (1) _____
(2) _____
(3) _____

Tons

Duration

Severity

Enter Code

3. Explanation: The project site is not used for nor is it suitable for agricultural or timber production, and there are no known scarce mineral or energy resources in the project area:

F. WATER QUALITY AND QUANTITY

1. Might the activity affect the quantity of water resources, within, adjacent to, or near the activity area?

X NO YES

If YES, specify water source affected and respective amount (gallons/day):

- (1) _____
(2) _____
(3) _____
(4) _____

Gallons/Day

Duration

Severity

Enter Code

2. Might the activity result in a deleterious effect on the quality of any water resource areas or watersheds?

X NO YES

If YES, specify water resource that might be affected:

- (1) _____
(2) _____
(3) _____
(4) _____

If YES, specify possible substance causing effects:

- (1) _____
(2) _____
(3) _____
(4) _____

Duration

Severity

Enter Code

3. Explanation: The proposed boundary change will not adversely affect water quality or quantity in the project area but will enable the B.R.A. to plan for the construction of sanitary and storm sewer facilities to insure protection of water quality.

5. AIR QUALITY

1. Might the activity affect the air quality in the project area, immediately adjacent areas, or the Air Quality Control Region?

X NO YES

If YES, specify possible substances affecting air quality:

- (1) _____
(2) _____
(3) _____
(4) _____
(5) _____
(6) _____

Duration

Severity

Enter Code

If YES, specify whether any key receptors may be in the affected area:

- (1) _____
(2) _____
(3) _____

Duration

Severity

Enter Code

2. Explanation:

The proposed boundary change will not affect air quality in the project area or Air Quality Control Region.

H. NOISE

1. Might the activity result in the generation of noise?

X NO YES

If YES, specify noise source:

- (1) _____
(2) _____
(3) _____

Duration

Severity

Enter Code

2. Explanation:

The proposed activity will not result in the generation of noise.

I. AESTHETICS

1. Might the activity cause a change in the visual character in or near the activity area?

☒ NO ☐ YES

If YES, specify natural and cultural features that may be changed:

- (1) _____
 (2) _____
 (3) _____
 (4) _____
 (5) _____
 (6) _____

Duration	Severity	Enter Code

2. Explanation:

The proposed boundary change will not adversely affect the visual character of the project area but will enable the Boston Redevelopment Authority to impose design controls for future development in order to enhance the aesthetic environment.

J. PLANNING

1. Will the activity require a variance from or result in a potential violation of any statute ordinance, by law, regulation, or standard, the major purpose of which is to prevent or minimize damage to the environment?

☒ NO ☐ YES

If YES, specify variances and/or statutes:

2. Will the activity require certification, authorization, review of plans, or issuance of a permit by any local, state or federal agency?

☐ NO ☒ YES

If YES, specify agency and action required:

Review and approval of Department of Community Affairs

Review and approval of Boston City Council

Review and approval of Boston Redevelopment Authority

3. Will the activity comply with all federal, state and local land use, transportation, open space, recreation and conservation plans?

☐ NO ☒ YES

If NO, state plan type and specific agency concerned:

- (1) _____
 (2) _____
 (3) _____
 (4) _____

Enter Code

4. Explanation:

The proposed boundary change complies with the Master Plan for the City of Boston 1965/1975

FINDINGS AND CERTIFICATION

A. It has been determined that this project is not one which may cause significant damage to the environment (Negative Assessment).

B. It has been determined that this project may cause significant damage to the environment (Positive Assessment). ☒

1. The draft impact report will be submitted on or about: ☐

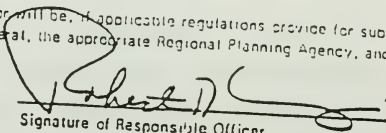
2. The draft impact report will be: Standard ☐ Extensive ☐

3. The draft impact report will be combined: ☐

4. The draft impact report will be joint in conjunction with: ☐

I hereby certify that this assessment has been or will be, if applicable regulations provide for subsequent circulation, duly circulated to the Attorney General, the appropriate Regional Planning Agency, and other review agencies as required by Appendix B.

DATE 7-26-76

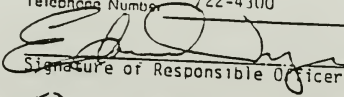

Signature of Responsible Officer

Robert T. Kenney
(print or type) Name of Responsible Officer

Signature of Preparing Officer (if different from Responsible Officer)

Address BRA, 1 City Hall Sq.
Boston, Mass. 02201

Telephone Number 722-4300


Signature of Responsible Officer

EDMUND MANGINI
(print or type) Name of Responsible Officer

Address 100 CAMBRIDGE ST, DCA
BOSTON, MA 02202

Telephone Number 727-7180

Part II

PROJECT SUMMARY

Part II - SUMMARY SHEET

Name of Project

Charlestown Navy Yard - Urban Renewal Plan Amendment

Project Description

The proposed project involves an extension of the Charlestown Urban Renewal Area project boundary to include the 105.7 acres of the abandoned Charlestown Navy Yard in order that the Boston Redevelopment Authority may effectively participate in the disposition, by the Federal government, of surplus property in the Navy Yard in a manner designed to assure a comprehensive development of the area which is compatible with local needs and is sensitive to historical, architectural, recreational, and environmental considerations. Proposed reuse of the property involves a mixed-use development program that would include residential, commercial, institutional, public park and recreational, and light manufacturing activity.

The project area is located in the Charlestown district of the City of Boston and is bounded by the Boston Inner Harbor, the USS Constitution National Historic Park, Chelsea Street, and the Little Mystic Channel.

State Identification Number

EOEA #02383

Submitting Agencies

Lead Agency: Boston Redevelopment Authority

Participating Agencies: Office of State Planning
Department of Community Affairs
Massachusetts Government Land Bank
Department of Environmental Quality Engineering
Division of Conservation Services

Submission Date

31 January 1977

Type of Report

Final Environmental Impact Report

Summary of Benefits, Costs, and Environmental Impacts of the Project and Alternatives

Major benefits of the proposed project include (1) the protection and renovation of a significant architectural and historic resource, (2) the construction of an attractive housing site which would assist in answering a city-wide need for new housing without disruption of the immediate community, (3) partial fulfillment of Boston's need for employment opportunities, particularly in the construction and blue-collar job fields, (4) the opening of the Charlestown waterfront to the community and general public, and (5) the conversion and redevelopment of a decommissioned military facility to productive community reuse.

Major costs include an estimated public investment of \$20,000,000 and a private investment of some \$100,000,000. Development of the site with a

mixed-used proposal would foreclose the possibility for conversion of the site to a private marine-oriented industrial facility (which, under existing economic conditions, has been found to be infeasible) and would involve the removal of certain buildings of actual or potential architectural or historic merit.

Major environmental impacts of the project would be those associated with air, noise, traffic, utilities and services, and the area's historic character. Short-term, construction phase impacts will primarily involve changes in air quality (especially in particulate levels), increased noise, increased truck traffic on local streets, and transportation and utility disruptions typically associated with large scale construction projects during the 10-12 years of project development. The major environmental impacts of the completed project would result from a significant increase in the number of persons in the community and subsequent demands for additional municipal and private utilities and services, increased traffic generation on local streets and the regional transportation system, and moderate increases in noise levels and air pollution.

Alternative development proposals that were considered include a "no-build" option (leasing out of the site to low-grade manufacturing and warehousing operations), two different mixed-use proposals, and conversion of the site to a private shipbuilding and ship repair facility. The "no-build" option would result in minimal preservation of the site and more likely in continued deterioration of much of the facility, and

the shipyard option would cause significantly greater adverse impacts on the physical environment while maintaining the original character and function of the site and producing a greater number of blue-collar jobs. The environmental impacts of the alternative mixed use developments would be essentially similar to the proposed project although generally lesser in magnitude.

Required Agency Approvals, Permits, and Environmental Reviews

The following is a listing of anticipated agency approvals, permits, and environmental reviews required to implement the proposed development of the Charlestown Navy Yard, as known at this date.

1. Approvals

- (a) Approval of Urban Renewal Plan Amendment by the Boston Redevelopment Authority (BRA) (approved 19 July 1976).
- (b) Approval of Urban Renewal Plan Amendment by the Boston City Council (approved 6 December 1976).
- (c) Approval of Urban Renewal Plan Amendment by the Massachusetts Department of Community Affairs.
- (d) Approval of rehabilitation and development activities to ensure compatibility with the site's historic character, pursuant to Memorandum of Agreements between the BRA, the State Historic Preservation Officer, the Advisory Council on Historic Preservation, and the appropriate Federal agencies.
- (e) Approval of Land Disposition Agreements by the BRA.
- (f) Approval of an application for transfer of 29.8 acres of the Navy Yard to the BRA for Historic Monument purposes, pursuant to Section 203(k)(3) of the Federal Property and Administrative Services Act of 1949, as amended, by the U.S. General Services Administration.
- (g) Approval of an application for transfer of 16.4 acres of the Navy Yard for public park and recreation purposes, pursuant to

Section 203(k)(2) of the Federal Property and Administrative Services Act of 1949, as amended, by the U.S. Bureau of Outdoor Recreation.

- (h) Approval of the purchase by the BRA of the "buy parcel" through negotiated sale, via the Massachusetts Government Land Bank, by the U.S. General Services Administration (pursuant to Congressional authorization) and the Land Bank.
- (i) Approval of an application for Federal assistance for construction of site improvements, pursuant to Title I of the Grant and Loan for Public Works and Development Facilities Program, by the U.S. Economic Development Administration (approved 9 November 1976).
- (j) Approval of an application for Federal assistance for construction of park and recreational facilities, by the U.S. Bureau of Outdoor Recreation and Massachusetts Division of Conservation Services.
- (k) Approval by the General Court for the relocation of the Massachusetts College of Art to the project site.

2. Agency Permits

- (a) Ch. 91 license to construct marina and waterfront facilities, by the Division of Waterways, Department of Environmental Quality Engineering (DEQE).
- (b) Ch. 91, s. 59B license to operate marina, by the Division of Water Pollution Control, DEQE.
- (c) Ch. 131, s. 40 (Wetlands) permit to construct marina and waterfront facilities, by the Boston Conservation Commission.
- (d) Permit for construction of marina and waterfront facilities by U.S. Army Corps of Engineers, pursuant to 1899 Rivers and Harbors Act, as amended.
- (e) Water Quality Certification for marina and waterfront facilities (pursuant to Section 401 of the Federal Water Pollution Control Act Amendments of 1972), by the Division of Water Pollution Control, DEQE.
- (f) Ch. 111, s. 31c permit to construct and operate on-site fossil fuel utilization facilities (if proposed) by the Department of Environmental Quality Engineering.
- (g) Approval of sanitary sewer system and permits for new extensions to the system, by the Division of Water Pollution Control, DEQE.

3. Environmental Reviews

- (a) Environmental Impact Report review by the Executive Office of Environmental Affairs, pursuant to M.G.L. Ch. 30, ss. 61 and 62.
- (b) Review of design standards for rehabilitation and new construction, pursuant to Section 106 of the National Historic Preservation Act of 1966.

Part III DESCRIPTION OF THE PROJECT AND ALTERNATIVES

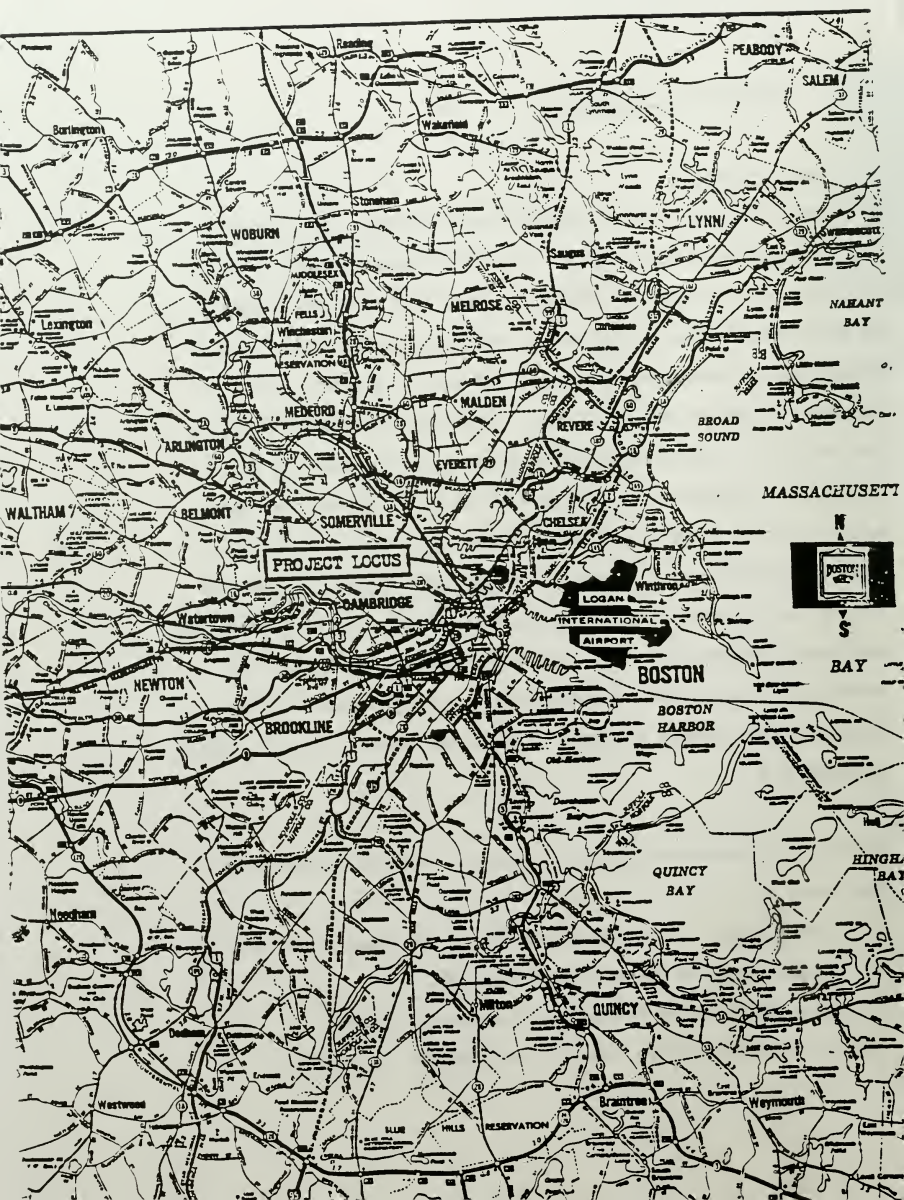
Part III DESCRIPTION OF THE PROJECT

1. Type of Project

The proposed project involves amending the Charlestown Urban Renewal Plan by extending the boundaries of the Urban Renewal Area to include 105.7 acres of the abandoned Charlestown Navy Yard in order to permit the Boston Redevelopment Authority to participate effectively in the disposition, by the Federal government, of surplus property in the Shipyard in a manner that will assure a comprehensive redevelopment of the area which is compatible with local needs and is sensitive to historical, architectural, recreational, and environmental considerations. Specific planning and design controls, pursuant to an overall reuse plan developed on the basis of three years of detailed planning effort, would be established to guide the implementation of a mixed-use development program that would include residential, commercial, institutional, public park and recreational, and light manufacturing activity. The proposed amendment to the Urban Renewal Plan is attached as Appendix B.

Briefly, the development program as presently envisioned proposes the following:

- (1) Approximately 1,500 units of new luxury and mixed-income housing (including up to 10% subsidized housing).
- (2) Some 80,000 square feet of retail/commercial space.
- (3) Up to 450,000 square feet for institutional activities.



PROJECT LOCUS

MASSACHUSETT



BAY

BOSTON

BOSTON HARBOR

QUINCY BAY

HINGHAM BAY

QUINCY

Weymouth

Braintree

HILLS RESERVATION

SALLI

Westwood

NEWTON

BROOKLINE

CAMBRIDGE

SOMERVILLE

BELMONT

WALTHAM

ARLINGTON

MEDFORD

MALDEN

EVERETT

REVERE

CHELSEA

LOGAN INTERNATIONAL AIRPORT

MELROSE

WINCHESTER

RESERVATION

WOBURN

STONINGTON

WATERBURY

Reading

PEABODY

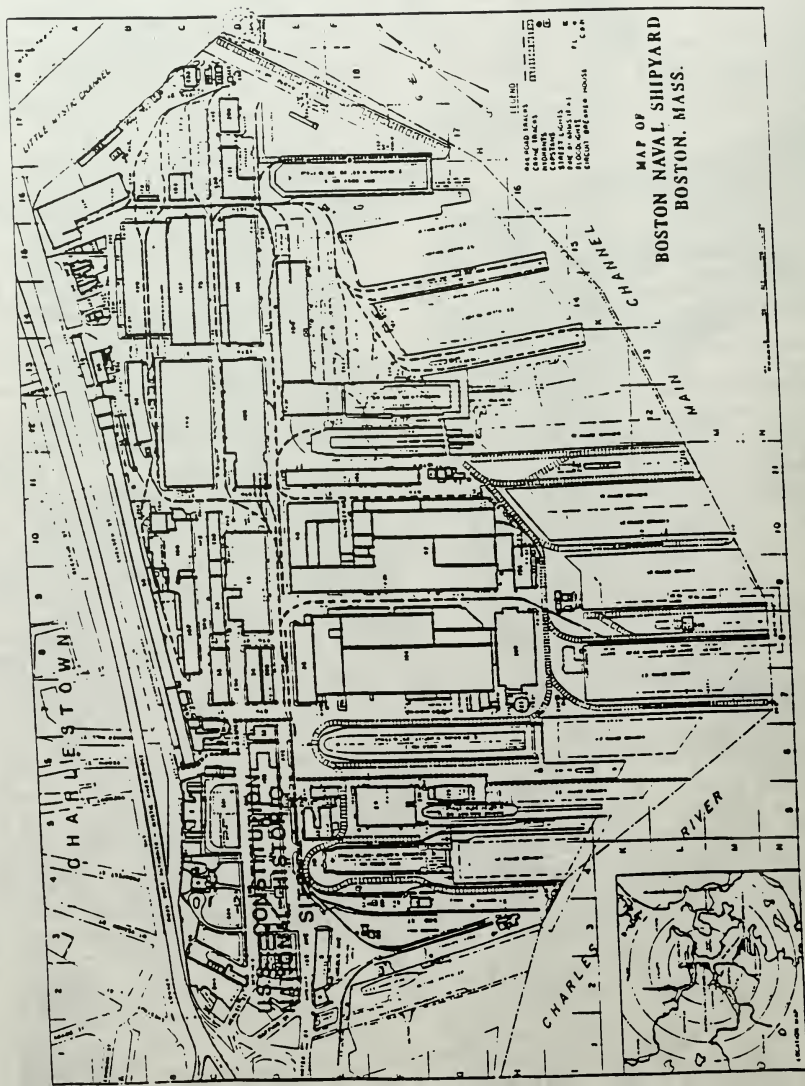
SALEM

LYNN

NAHANT BAY

BROAD SOUND





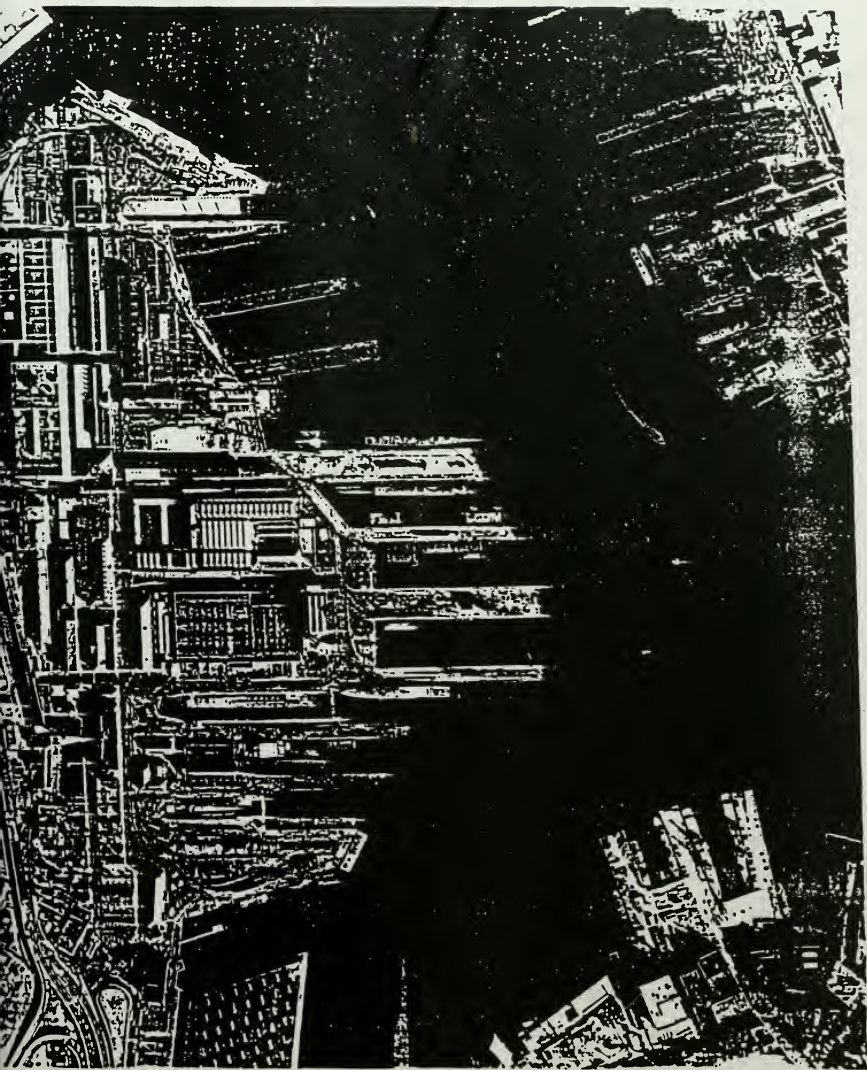


Figure III.4: Aerial View of Charlestown Navy Yard (1973)

- (4) Over 60,000 square feet of office and loft industry space.
- (5) A 300-700 room hotel and conference center.
- (6) Up to 250,000 square feet of labor-intensive light industry.
- (7) A waterfront park and approximately 550 ships in public and private marinas and docking facilities.

In order to implement this development program, specific planning actions are proposed in the Urban Renewal Plan amendment and include:

- (1) The creation of an Historic Monument Transfer Area which will permit the conservation of the historical and architectural character of the site and enhance the economic effects of redevelopment or rehabilitation through a mixed reuse program.
- (2) The creation of a New Development Area which will make available an attractive site for new housing construction designed to respect and complement the historic and architectural integrity of buildings in the adjacent Historic Monument Area.
- (3) The design of a waterfront park and marina area to provide open space, enhance the waterfront environment, and provide opportunity for public access to the water's edge.
- (4) The layout and design of new streets, street lighting, sidewalks, and public utility improvements.

- 5) Improved vehicular, pedestrian, and mass transit access to the area to service the proposed new uses for the Shipyard and the adjacent USS Constitution National Historic Park.

detailed description of the development program follows in subsequent sections of this Part.

2. Objectives of Development and Project Benefits

In planning for the redevelopment of the Charlestown Navy Yard, potential uses were considered in the context of the following objectives and benefits:

(1) Development of the Shipyard Must Be Directed Toward the Creation of New Jobs for Boston Residents

The closing of the Shipyard in 1974 resulted in a serious loss of job opportunities for the Boston resident labor force. The current unemployment rate in Boston is 9.8%, due in part to a national recession. Therefore, it is important that conversion of the site begin as soon as possible in order to create construction related jobs in one of the most severely affected employment sectors. More importantly, the reuse of the Shipyard should generate new permanent employment opportunities which match the needs and skills of the resident labor force. Every effort will be made to attract modern manufacturing firms to offset the loss of blue collar jobs. At the same time, it should be recognized that Boston's real long-term growth is in the service sector and that new activity in office

commercial activities and tourism is similarly important. The proposed redevelopment of the Shipyard is expected to produce 400 jobs per year during construction and 1,300 permanent jobs at project completion.

(2) Development of the Shipyard Should Be Geared toward Meeting Part of the City's Critical Need for New Housing

Boston has a scarcity of land available for new housing construction. Land which is available is usually small in area, in scattered sites and requires relocation of residents. The abandoned Shipyard provides an attractive site which can be developed without disruption of the immediate community. The project site is large enough so that a portion of it can be developed for residential use and have a significant impact on the City's needs for additional housing.

(3) New Uses of the Shipyard Should Protect, as Far as Possible, the Architectural, Historical and Environmental Character of the Site

The Shipyard is important both for its fine historic buildings as well as for its character as a naval shipyard. Plans for the site will attempt to preserve not only buildings of architectural and cultural merit but also some of the essential qualities of the Shipyard -- the piers, the scale, the textures, and the relationship to the water. Every effort will be made to reuse and preserve significant buildings on the site.¹ There are many examples in Boston and elsewhere of creative and economically viable reuses of similar historic structures.

¹Specific design controls and procedures to preserve the historic character of the Shipyard are detailed in Part IV, 1. Archaeology/

General Description of Development

The concept for the reuse of the Charlestown Naval Shipyard is based on the need to create an economically viable project that maximizes diverse reuse goals and objectives.¹ The proposed design includes a mixture of mutually supportive uses which consider the physical characteristics of the site and coincide with growth sectors in the Boston economy. The interrelated nature of the use components of the plan is considered key to the success of the entire project.

Development Concept

The development concept attempts to take maximum advantage of the attractive physical location of the Shipyard on Boston's waterfront. The presence of the USS Constitution National Historic Park and its potential for attracting a million visitors a year is a major impetus for tourism-related investment in the Shipyard. The many valuable historic buildings within the site, and the intown yet insulated location of the Shipyard, suggest development in the Navy Yard for tourism, including hotel, retail, and museum and other institutional uses.

The site is considered an ideal location for new residential development. Approximately 30 acres of land on the water's edge adjacent to the historic area would be an excellent site for housing. The presence of

¹Supporting documentation concerning the economic feasibility and marketability of the proposed project (and the alternatives) is contained primarily in the following reports: (1) Boston Redevelopment Authority, Financial Feasibility Analysis, Charlestown Navy Yard Development, submitted to the Department of Community Affairs on 26 January 1977, and (2) Wallace, Floyd, Ellenzweig, et al, Land Use and Transportation Study, Boston Naval Shipyard, Phase II Report, 19 July 1974, Section V. (q.v.).

housing could, in turn, enhance the demand for commercial activities in the Shipyard and bring more people and continuous activity onto the site.

Appropriate space is available within the Shipyard for light manufacturing, office space and similar loft-space uses without impairing the visual quality of the entire site. The use of the northernmost corner of the site plus second story space in selected buildings for light manufacturing, particularly craft related and incubator industries, could enhance the job creation goals of the City and local community.

The presence of these activities and their respective inhabitants and visitors could provide the basis for developing major new open space and recreation facilities that would serve the residents of the Shipyard, Charlestown, and the entire Boston region. Proposed facilities include an extensive harborfront promenade, 6.4 acres of open park land, and public and private marinas. Appropriate landscaping and open space and the presence of boats along an active waterfront could all serve to enhance the character and quality of the site.

Development Districts

The character and location of buildings within the project area and the relative architectural/historical merits of those buildings suggest the division of the property into two distinct development districts:

(1) Historic Preservation District

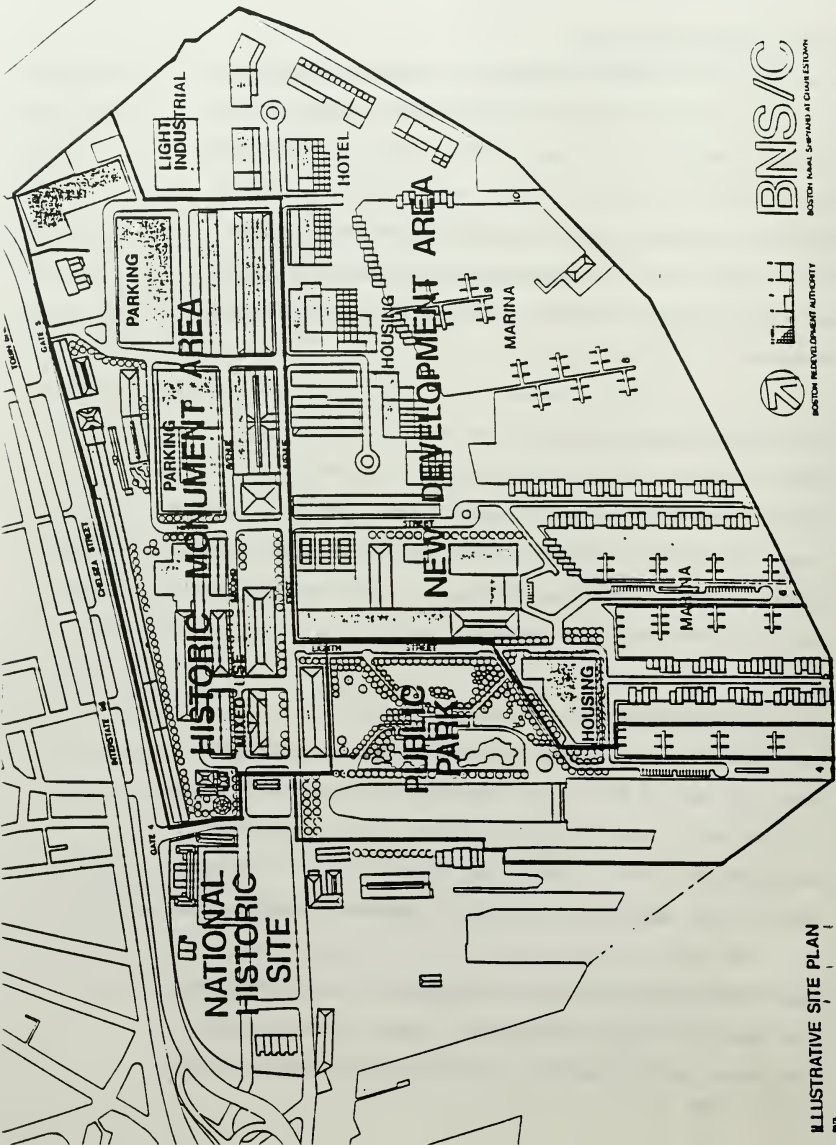
The section of the Shipyard containing the buildings identified as particularly significant can be defined to include the area from the western boundary of the site to First Avenue plus Building #36, the sail loft. This district contains some of the Parris granite buildings, the Ropewalk, the tar and hemp houses, and the chain forge. Every effort will be made to reuse this section preserving the historic character of the individual buildings and the general environment.

The historic district would be lined visually to the National Historic Park and individual buildings would be adapted for tourism, commercial, and other uses while respecting the integrity of facades. In order to enhance the reuse potential of the historic and architecturally significant structures, it will be necessary to remove a few structures of lesser importance.

(2) New Development District

The area between First Avenue and the waterfront is heavily encumbered by massive 20th century industrial buildings. Five major buildings contain over 700,000 square feet. These structures overshadow the historic district and visually block it from the water, and are too large and too close together for adaptive reuse.

Development of this district would be based on some adaptive reuse plus demolition and new construction. Housing, hotel, and park development would be designed to complement the historic district.



ILLUSTRATIVE SITE PLAN

Figure III.5



BNS/C

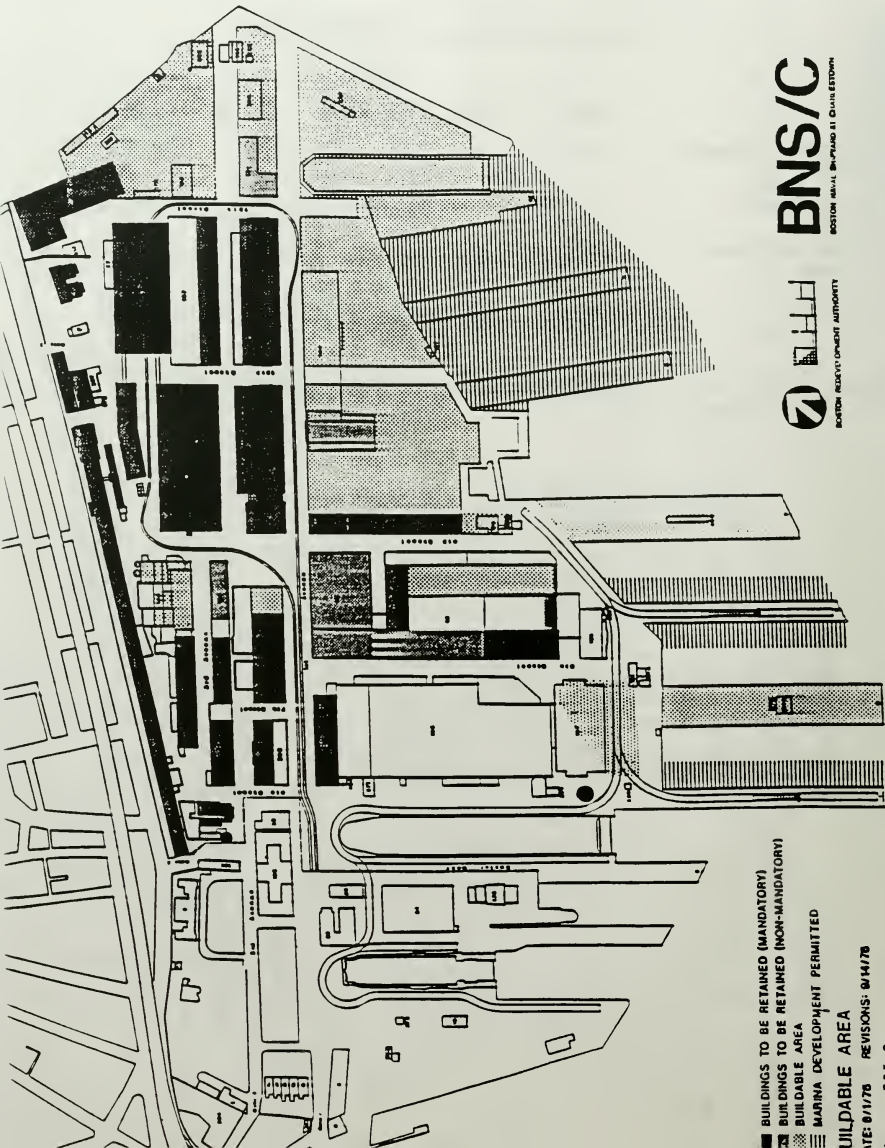
BOSTON NAVAL SHIPYARD AT QUINN ESTUARY

BOSTON REDEVELOPMENT AUTHORITY

Table III.1: Charlestown Navy Yard - Development Areas

		<u>Acres</u>				
		<u>Land</u>	<u>Piers</u>	<u>Dry Docks</u>	<u>Water</u>	<u>Total</u>
A.	Historic Monument Area	30.9	-	-	-	30.9
B.	Public Park	8.1	1.9	1.9	4.5	16.4
C.	New Development Area	29.2	9.0	1.2	19.0	58.4
	Total	68.2	10.9	3.1	23.5	105.7

Source: Land Parcel Plan (Alternative 1), Parsons, Brinckernhoff, Quade & Douglas, 10/20/76



■ BUILDINGS TO BE RETAINED (MANDATORY)
 ▨ BUILDINGS TO BE RETAINED (NON-MANDATORY)
 ▨ BUILDABLE AREA
 ▨ MARINA DEVELOPMENT PERMITTED

BUILDABLE AREA

DATE: 9/1/78

REVISIONS: 9/14/78

Figure III.9



BOSTON REDEVELOPMENT AUTHORITY

BNS/C

BOSTON SMALL SHIPYARD AT QUINN ESTOWN

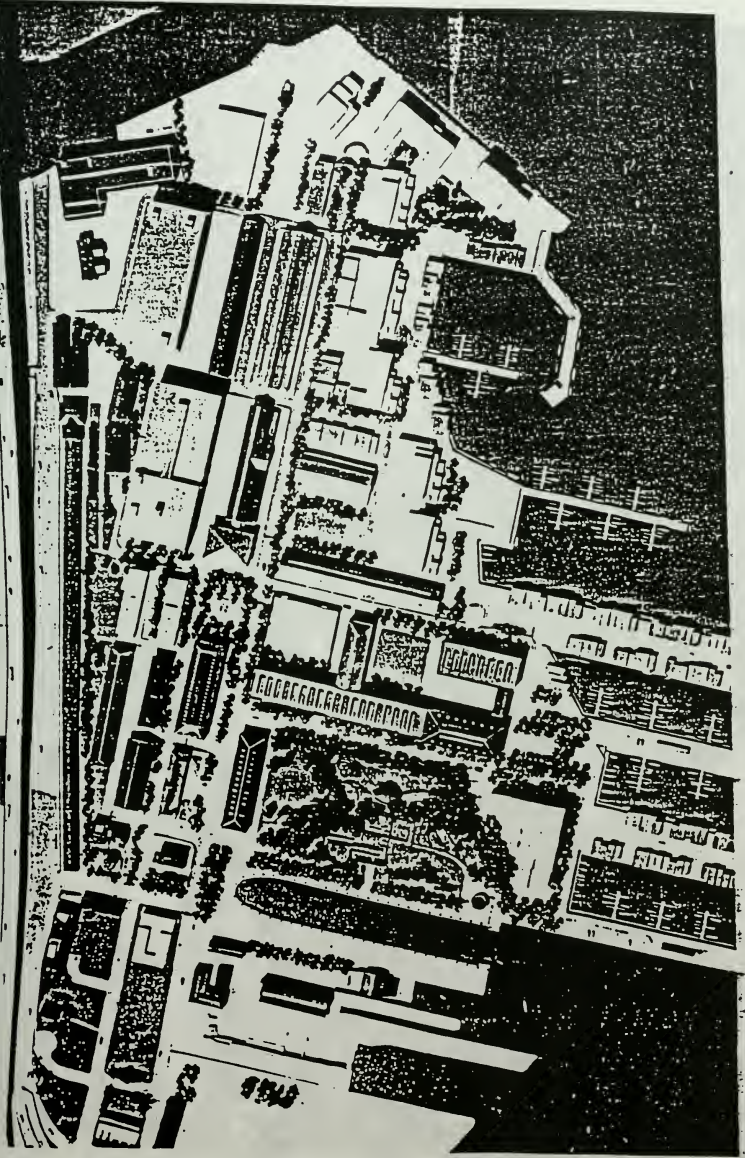


Figure III.6: Aerial View of Model - Proposed Charlestown Navy Yard Development

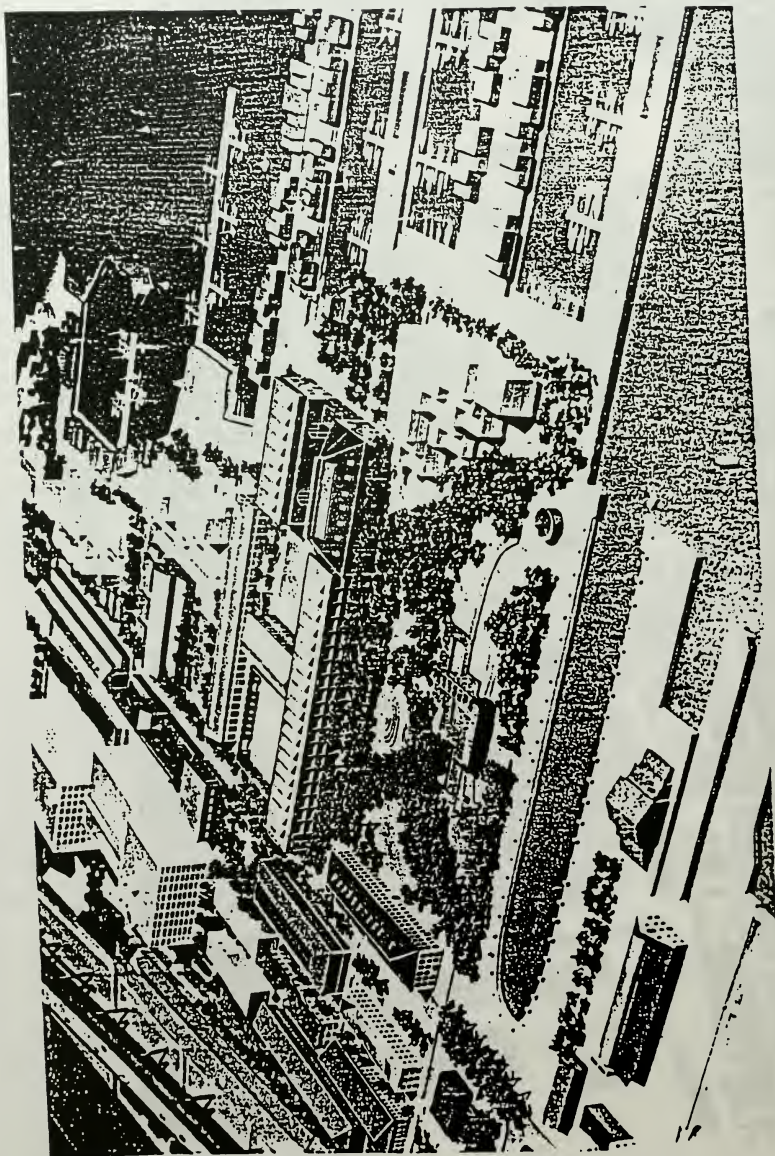


Figure III.7: View of Proposed Charlestown Navy Yard Development Model

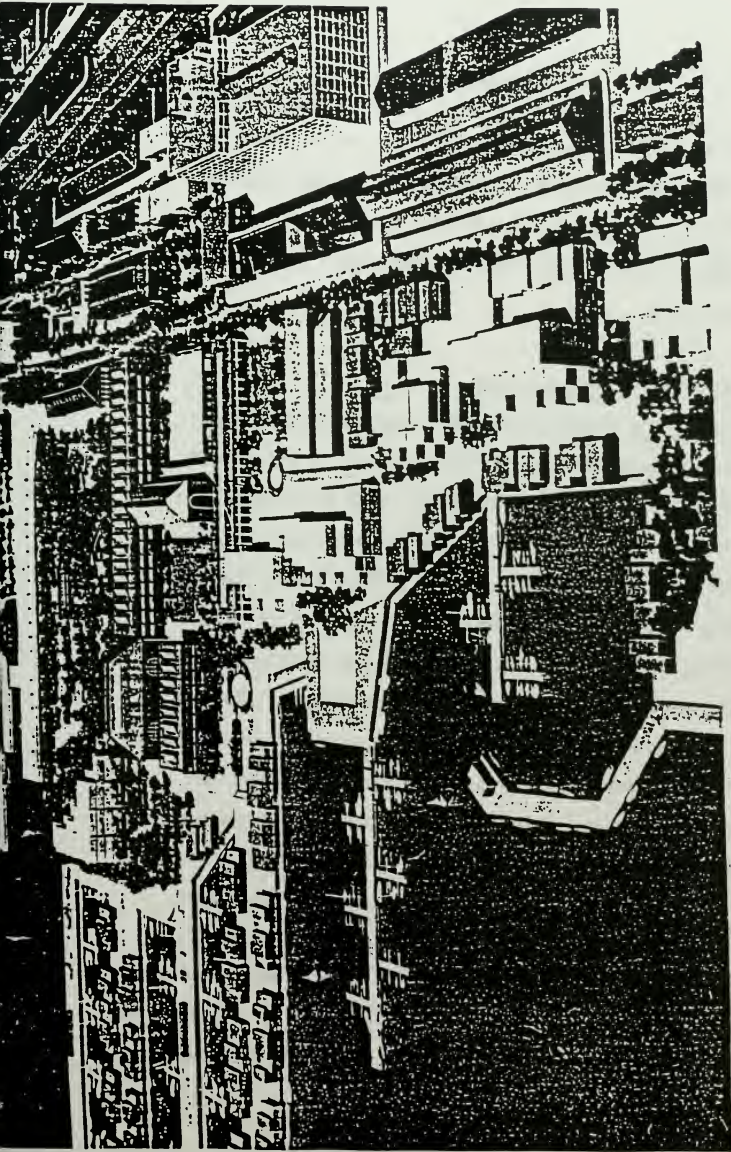


Figure III.8: View of Proposed Charlestown Navy Yard Development Model

Use Areas

Within this general district concept specific areas can be identified by type of use. The defining of these areas suggests that appropriate zoning and methods of acquisition for different portions of the Shipyard site be utilized. These areas are further identified on the Illustrative Site Plan (Figure III.5).

(1) Historic Mixed Use Development Area

That portion of the Shipyard bordered by Chelsea Street between Gate 4 and Gate 5 and extending to First Avenue and Building 36 will be maintained and preserved essentially as an historic zone. The intent of reuse is to create an attractive historic neighborhood. This area, which contains about 2 million square feet of floor space in reusable structures, will be restored to recapture the architectural and naval significance of the buildings within a pedestrian-oriented commercial and museum environment. Related open space areas will be appropriately landscaped and provided with street furniture designed to create a pleasant atmosphere for shopping and strolling. This historic section will be a visual continuation of the National Park and will contain retail, restaurant, and other tourist-oriented facilities to attract Park visitors. Housing, office space, and loft industry also will be a part of this historic mixed-use area. The power plant, Building 159, and World War II additions to structures will be demolished in order to restore the area to its original 19th century character.

Table III.2: Phasing of Residential Development
New Development Area

<u>Phase</u>	<u>Approximate Timing</u>	<u>Development Component</u>
Phase I	1977-1978	380 rental apartments (Building 42) 10-20 townhouses Marina for 95 boats
Phase II	1979-1980	100-unit apartments (Building 103) 30-50 townhouses
Phase III	1981-1982	95-unit apartment building (new) 30-50 townhouses Marina for 150 boats
Phase IV	1983-1985	180-unit apartment building (new) 30-50 townhouses
Phase V	1985-1986	95-unit apartment building (new) 30-50 townhouses

6. Alternatives to the Proposed Project

The formulation of the Charlestown Navy Yard reuse and development program did not evolve in a vacuum. In 1973, when the closing of the Navy Base was first announced, both the U.S. Department of Housing and Urban Development (HUD) and the Economic Development Administration (EDA) funded the City of Boston to explore reuse options for the site. The BRA, jointly with the City's Economic Development and Industrial Commission, contracted for an extensive land use and transportation study of the Shipyard. This study,¹ completed in 1974, was the work of a consortium of consultants under the management of Wallace, Floyd, Ellenzweig, Inc. The City's mandate was that the consultants identify and evaluate a series of alternatives for the reuse of the site.

The Wallace Report identified three alternative development packages for the Charlestown Navy Yard. The present BRA development program is based on a modification of option "C" of the report - a hotel/convention/housing/institutional package that would produce a high density, intensively used site with extensive development of new uses. This package proposed some 1,000 units of luxury housing on the eastern end of the site, a 1,000 room hotel and convention center adjacent to the National Historic Park, rehabilitation of the Historic Area with a college, museums, office/loft, and retail uses, a 200 slip marina, and an extensive open space/pedestrian system connecting all elements with each other and with the waterfront.

¹ Wallace, et al, Land Use and Transportation Study, Boston Naval Shipyard, Phase II Report, July, 1974. This document also evaluated proposals for the South Boston Naval Annex, which was similarly decommissioned in 1974.

The BRA program that was adapted from this option differs principally by the proposed development of a public park on the originally-proposed hotel site, relocation of the hotel to the eastern edge of the site, and the addition of a small light industrial area. The park was added to fulfill a community need for waterfront open space and to serve the visitors to and residents of the Shipyard, and manufacturing uses were included to provide job opportunities in accordance with the redevelopment objectives. Although the Wallace study identified the original hotel site as being optimal in terms of best views, market conditions dictated that the hotel would not consider locating within the Shipyard until housing, the marina, and commercial activities were well underway. Since development would occur from west to east, the most appropriate space to reserve for hotel development was considered to be at the end of First Avenue in the vicinity of Dry Dock No. 5, which additionally is closer to the major parking facilities and access point at Gate 5.

It should be noted in particular that the redevelopment program envisioned by the Boston Redevelopment Authority, which is described as the proposed project in this Impact Report, is a "maximum-build" concept. The density of development proposed, including building heights, number of residential units, and space for commercial, institutional, and industrial uses, is considered the maximum possible within the limits of (1) the proposed zoning (all of the site is proposed to have a Floor Area Ratio of either/or 2), (2) the planning and design objectives and the building requirements of the Urban Renewal Plan amendments, and (3) the proposed design controls to ensure the quality of the new develop-

ment, which specify those buildings to be retained, the areas available for new construction, open space requirements, and required visual easements.

For purposes of this Report, four alternative development options to the proposed redevelopment program were considered - a "no-build" option, the two other mixed-use development packages evaluated in the Wallace Report, and reconversion of the site to a private shipyard facility. These alternatives are described as follows:

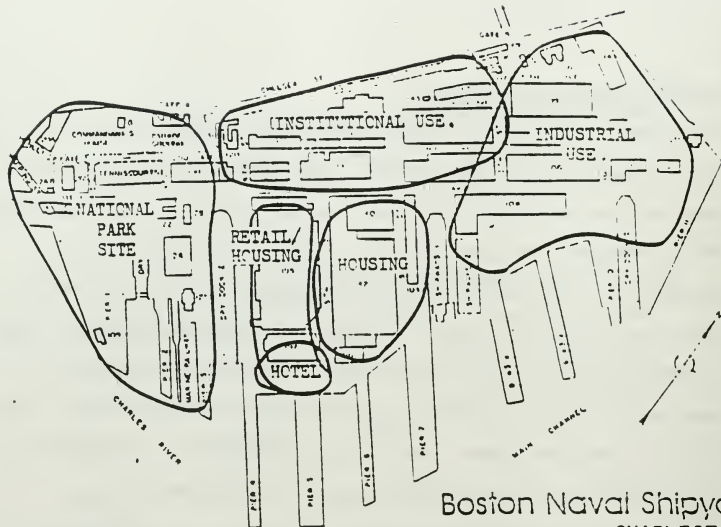
(1) "No-Build"

The "no-build" alternative involves essentially no local government participation in the development of the Navy Yard. Rather, the site would be auctioned or leased out as a unit or in parcels by the General Services Administration. The historic area would either deteriorate as an historic resource or be selectively retained by the National Park Service (e.g., the Ropewalk complex). The balance of the area possible would be leased out for bulk warehousing and low-grade industrial use utilizing the existing facilities with minimal renovation. Under this alternative, it is estimated that probably only half the site would be so disposed, and the remainder would continue to deteriorate. Given the existing conditions of the property and the obsolescence of much of the space, it would be extremely difficult to project that any significant redevelopment would occur without public participation.

(2) Industrial/Institutional Option

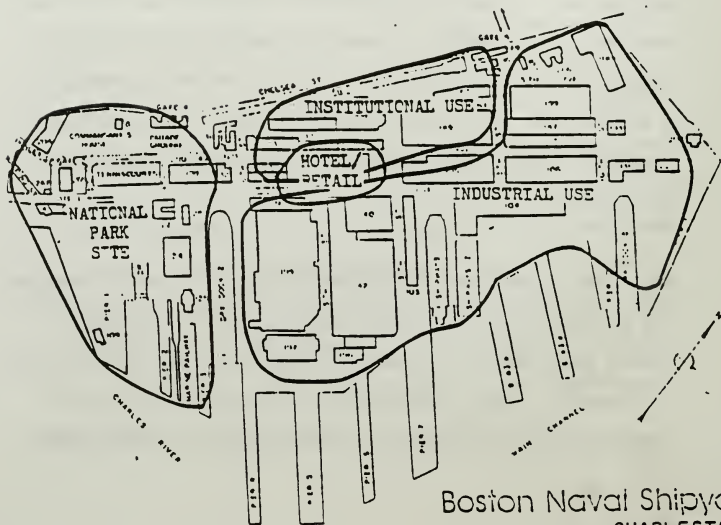
This concept (option "A" of the Wallace Report) provided for 50 acres of the site along the waterfront to be devoted to industrial reuse with the remainder of the site - the historic area - retained for institutional and commercial use. Contemplated industrial uses included heavy machinery and related manufacturing, tool and die production, and marine-oriented industry and warehousing, chosen to ensure compatibility with the National Park and institutional uses and to reuse the existing structures and facilities to reduce costs. Within the historic area, it was proposed that the National Park Service acquire the Ropewalk as part of the National Historic Park and that the remainder of the area be devoted to a museum, a 200 room hotel, an industrial/trade school facility, and retail shops, with some upper floor office and loft-type reuses. Public open space was limited to the existing streets and some landscaped pedestrian spaces created by removal of less historically significant buildings and additions. Parking was provided principally in Building 199. This alternative relied primarily on reuse and renovation of the existing buildings, with limited demolition and new construction.

While this alternative would involve a minimum of public investment and the possibility of creating 2,900 new jobs, it would also involve questionable environmental impact on the National Park and the community. More significantly, the marketability of this concept was very questionable, with estimates of at least 7 years



Boston Naval Shipyard CHARLESTOWN

HOUSING/INDUSTRIAL/INSTITUTIONAL OPTION



Boston Naval Shipyard CHARLESTOWN

to market the industrial space. At the same time, the successful marketing of a large area of Charlestown industrial space could seriously affect the market for similar industrial space in South Boston, other parts of the City, and the rest of the metropolitan area.

The reuse potential of the historic area also would be extremely questionable due to the proximity of the industrial activity. The historic buildings would have use value primarily as office space and support activities for the industrial area and as institutional space that would relate directly to the Park. Perhaps the only way to ensure the preservation and appropriate reuse of this area under this alternative would have been through the extension of the National Historic Park to include most of the historic area.

(3) Housing/Industrial/Institutional Option

This alternative (Option "B") was made up of uses in the middle range of possibilities that were investigated. Demolition was more extensive than in the Industrial/Institutional package but considerably less than in the proposed development scheme. Industrial space was reduced to 28 acres of land at the north end of the site, consisting principally of light industrial uses and warehousing. A residential/commercial complex consisting of a mid-sized hotel (400 rooms), a moderate amount of housing (500 units), and retail/restaurant uses was proposed adjacent to Dry Dock No. 2, between First Avenue and the waterfront. The historic area was be be

devoted to institutional uses, including museums and a state college, together with some retail uses and upper floor offices and loft-type uses in the renovated buildings. The public open space system included an extensive system of pedestrian paths and waterfront promenades, a large plaza in the historic area created by the removal of the power plant, and flooding of Dry Dock No. 2 to bring water deep into the site. A 200 slip marina also was proposed in front of the housing. Parking was to be provided in Building 149 and on several surface lots within the housing/hotel area.

While this option would involve greater density and more capital investment than the previous alternative, it was considered more marketable as a development concept since it introduced the need for mixed use on a site of this size. However, problems with this alternative included the absence of any provision for major waterfront open space and little indication that appropriate light industrial uses could be identified to fully occupy the 28 acres.

(4) Shipyard Reuse

Besides the mixed development concept, the other primary reuse option was the conversion of the site to a private shipbuilding and ship repair facility, utilizing the existing buildings and equipment for their originally-intended purposes. In addition, the possibility of including other manufacturing uses also was contemplated. This course of action would require minimal changes

within the Shipyard other than upgrading of the utilities and the various facilities. It was also considered as the best means to reemploy labor displaced by the closing of the Shipyard, to further the creation of needed blue-collar jobs, and to minimize public sector investment in converting the site to civilian use.

Substantial efforts were begun by the City of Boston in 1973 to promote and market the site as a unified shipbuilding facility and as individual buildings to other manufacturers. However, after two years of such marketing efforts, it was concluded that the Charlestown Shipyard was too crowded with obsolete structures and too limited in terms of access for successful modern industrial reuse.

Part IV DESCRIPTION OF EXISTING ENVIRONMENTAL CONDITIONS
AND PROBABLE IMPACT OF THE PROJECT AND ALTERNATIVES

Part IV DESCRIPTION OF EXISTING ENVIRONMENTAL CONDITIONS AND PROBABLE IMPACT OF THE PROJECT AND ALTERNATIVES

V.A CHARLESTOWN - COMMUNITY CONTEXT

Physical Setting

The Charlestown Navy Yard is located on the eastern waterfront of the Charlestown section of the City of Boston, which is situated to the north of the downtown area of Boston and is bounded by the Charles River, the Inner Harbor, the Mystic River, and the recently-completed I-93 Expressway. Originally a hilly peninsula, Charlestown was expanded over the years by filling around the edges to accommodate industrial development. Geographically separated from the rest of Boston, the town is connected to it by I-93 and the Tobin Bridge, which transverse the community's southern and eastern edges. These elevated highways, and an elevated MBTA structure (since demolished) along Main Street, have had serious blighting effects on the town.

Historical Background

Settled early in the 17th century, Charlestown was a thriving harborside community of shipyards and wharves by the time of the Revolution, during which the British burnt the entire town in the Battle of Bunker Hill. The town was rebuilt and by the early 19th century again flourished as a port. The Navy Yard itself was established in 1800 as the nation's second naval shipyard, and as it developed a mixture of industry and port related activities was established, which continues to this day. The introduction of this industry triggered the development of large areas of Charlestown for working class houses and tenements, a develop-

ment which lasted into the present century. The demand for ships generated by World War I greatly increased activity in the Navy Yard and put severe pressures on the existing housing stock to meet the demands of new workers and crews awaiting repair of their ships. Overcrowding and property neglect resulted, which, in turn, led to further deterioration, accelerated by the Depression which followed. The town's population began a long period of decline which, except for a resurgence of intense Shipyard activity during the Second World War, was not broken until redevelopment of the area began under a Federally-financed urban renewal program.

An Urban Renewal Plan was initiated in 1960 and was approved in 1965; implementation is now nearing completion. Under the Plan, extensive redevelopment and rehabilitation have taken place in Charlestown, including the construction of two major subsidized housing developments (Charles Newtowne - 262 units, and Mishawum Park - 337 units), 96 units of BHA elderly housing scattered in low-density structures throughout the town, and 38 units of single and two-family market housing, and the rehabilitation of over 1,560 residential units. Major public construction has included the new Kent Community School, the Charlestown Public Library, a new fire station near Sullivan Square, a community recreation center on Medford Street, new and improved existing park and playground facilities, the Bunker Hill Community College, relocation of the MBTA rapid transit and demolition of the former elevated structure, and extensive public improvements such as street and sidewalk reconstruction,

street resurfacing, sewer and water line replacement, and new street lighting. Project activities remaining to be completed include the new Charlestown High School on Medford Street, a shopping center at Thompson Square, the Bunker Hill Elementary School, and additional new and rehabilitated housing. To date, some \$45,000,000 has been invested in Charlestown under the renewal program.

Present-Day Charlestown

Charlestown is basically a triangular-shaped residential community surrounded by industries and other non-residential uses. The housing stock is predominantly single and two-family dwellings and one-to three-family brick or wood frame row housing, the majority of which is in good to fair condition. Charlestown has one public housing project - the 1,149 unit Bunker Hill project between Bunker Hill and Medford Streets - north of which is the Charles Newtowne development adjacent to the Little Mystic Channel. The town's principal commercial areas are along Main and Bunker Hill Streets. Major industrial uses are located on the northern side of Medford Street and the Little Mystic Channel and include sugar refining and warehousing, U.S. Gypsum, Schiavone's scrap metal operations, and the Moran Terminal, Boston's primary container-port. At Sullivan Square is a major MBTA terminal and repair facility. To the west is the Neck area, physically separated from the rest of Charlestown by New Rutherford Avenue, a major arterial road; this section includes some industrial land and warehousing operations, H. P. Hood and Sons, and the Bunker Hill Community College campus. Extending

into the harbor east of the Tobin Bridge is the Shipyard (decommissioned in 1974), the USS Constitution National Historic Park, and Hoosac Pier.

The immediate environment of the Navy Yard includes the Little Mystic Channel to the north, on the other side of which is the Moran Container-port area, and the Boston Inner Harbor to the east and southeast.

Adjacent on the southwest is the National Park, home of the USS Constitution ("Old Ironsides") since the War of 1812, and farther southwest is the City Square commercial area and the extensive I-93 - Fitzgerald Expressway interchange and ramp area. The two-level Tobin Bridge separates the Yard from the residential areas along Lowney Way, Bunker Hill Street, and Medford Street. This neighborhood consists of private three to six story brick row houses, the three story brick apartments of the Bunker Hill Housing Project, and the Charles Newtowne two and three story brick, concrete, and wood apartments. A few local shops are found along the principal streets, and adjacent to the Yard are Barry Playground and the new Kent School.

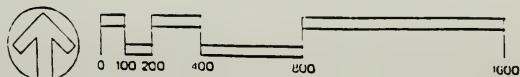
Social Characteristics

Charlestown is a strong family-oriented community with a present population estimated at 17,000. Although the population had been steadily declining over the past 30 years, this trend now appears to be reversing as the town has become increasingly attractive as a result of the recent redevelopment. The community's population structure has remained fairly stable, however, and consists primarily of descendants of Irish settlers



Figure: IV.A.1

Charlestown: Project-Related Land Use



of five or six generations ago, Canadians, and a recent influx of young families and single people of varied ethnic backgrounds. Over 98% of the population is White; most of the working force are clerical or blue-collar workers with a 1970 median household income of approximately \$9,000. Some 29% of Charlestown's families earned less than \$5,000 in 1970. The recent urban renewal efforts and the removal of the elevated MBTA line have encouraged interest in the town by outsiders; considerable private renovation is taking place and a growing number of professionals have been moving into the area.

A detailed description of the existing characteristics of the Charlestown community is given in Appendix C.

V.B. TRANSPORTATION

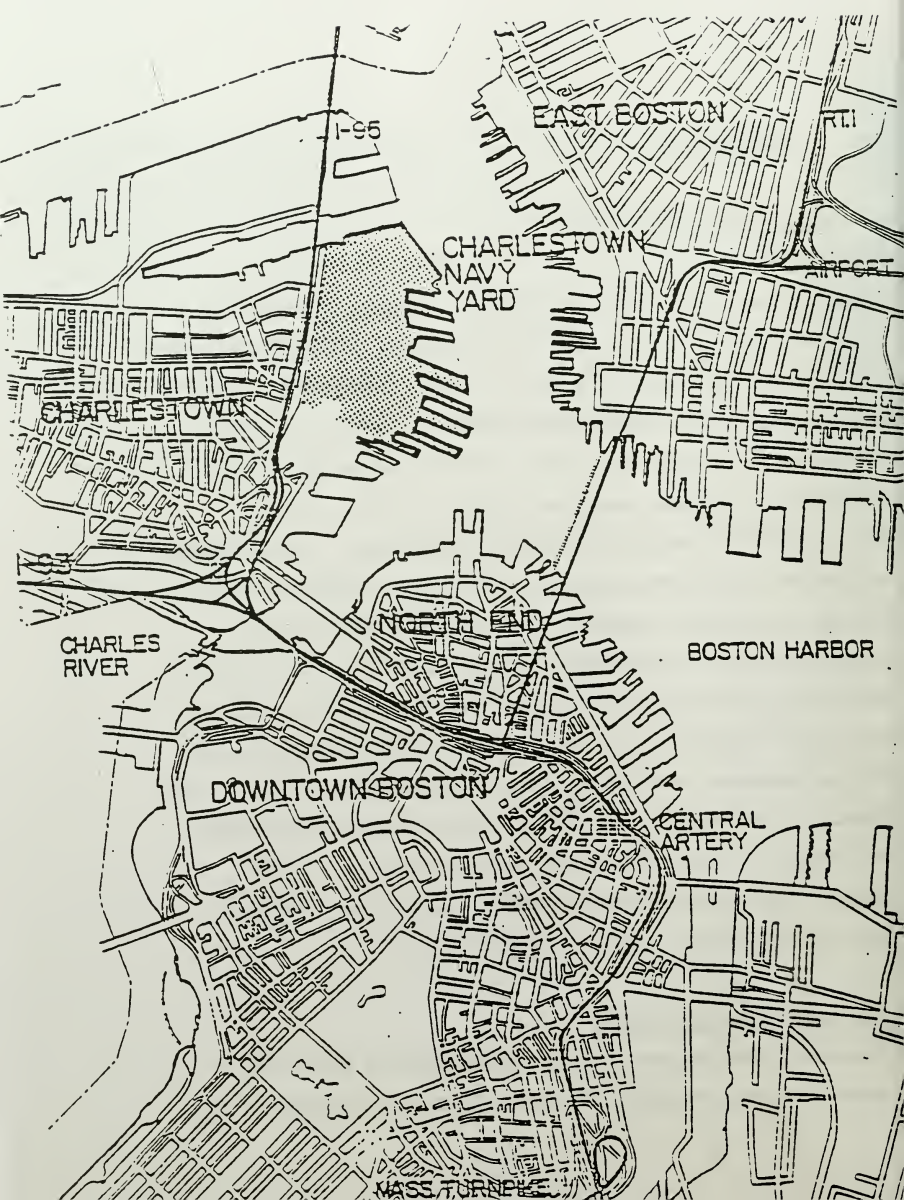
Existing Transportation Systems

Regional Highway Access

A number of the Boston region's major radial expressways converge in Charlestown and offer the potential for good regional access to the Charlestown Navy Yard (see Figure IV.B.1). The I-93 Expressway is a high-speed route from the north which connects to the outlying population centers in the region and beyond. The Tobin Bridge and its connections to the Northeast Expressway, Route 1, and I-95, provide a direct route to the north and northeast (via Route 128). The Massachusetts Turnpike and the Southeast Expressway offer regional access from the west and south through connections to the Central Artery and Tobin Bridge approaches. An additional auto access from the west is available over Storrow Drive-Soldiers' Field Road. All of these routes converge just south of the Shipyard and connect with the City Square ramp system. The Charlestown and Judge Gilmore (Prison Point) Bridges, while not tied directly to the regional expressway system, also provide access routes from portions of Somerville, Boston, and Cambridge; and Rutherford Avenue, on the western edge of Charlestown, serves as an alternate access, in conjunction with I-93, from the north.

Charlestown Circulation System

The streets which now serve the Charlestown community spread out in a general east-west fan shape with Sullivan Square at the center of the



fan. Main Street, Warren Street, Bunker Hill Street, and Medford Street form the backbone of this arterial system and serve the major part of the locally-oriented traffic. Each of these streets carries two lanes of moving traffic (one in each direction) and provides the abutting properties with continuous access and a considerable amount of curb parking. During the afternoon peak periods traffic volumes range from 350-550 vehicles depending upon the street and location. The volumes are lower at the Sullivan Square node than at the easterly nodes, an indication of the downtown-to-Charlestown commuter pattern. Demolition of the existing MBTA elevated structures on Main Street recently has been completed and is a significant improvement to the level of traffic service. Currently, plans for reconstruction of Main Street to downplay the street's existing role as a through-traffic short-cut and to provide long-needed pedestrian amenities are in the development stage.

Traffic circulation in the north-south direction is hindered by the lack of a continuous route across Charlestown. For the most part, traffic movements oriented in this direction now use Chelsea Street and Lowney Way along the easterly edge of the residential community and penetrate these areas via Bunker Hill or Medford Street. This route is narrow and indirect and now carries 310-470 vehicles in the afternoon rush hour. Truck volumes are substantial along Lowney Way, Chelsea Street, and Medford Street. Current plans for a connection of Chelsea and Water Streets are well underway with the construction drawing phase expected early in 1977. This circulation improvement will alleviate the north-

TO NORTH SHORE
I-95

GATE 5

GATE 4

TO/FROM CAMBRIDGE

CHARLESTOWN
NAVY YARD

TO/FROM DOWNTOWN
BOSTON

CONNECTION TO
STORROW DRIVE

SOUTHEAST

outh truck traffic conditions on Lowmey Way and help improve capacity problems in City Square. In addition, this new route will provide a direct connection between City Square and Gates 4 and 5 of the Navy Yard and should ensure that traffic generated by the Yard would have little or no negative impact on the Charlestown residential community.

Existing Traffic Characteristics

Traffic operations in Charlestown are characterized by (1) heavy through-traffic along the periphery of the community on Rutherford Avenue, Interstate 93, and Tobin Bridge; (2) congestion of arterial and expressway traffic within City Square; and (3) substantial numbers of trucks on much of the arterial street system.

Because of its proximity to downtown Boston and its major connections with the regional transportation network, peak hour traffic congestion is not uncommon in City Square. However, the Boston Redevelopment Authority and the Massachusetts Department of Public Works have developed a plan with assistance from the Charlestown community for improving traffic circulation in the City Square area. Briefly, the plan would provide for the redirection of major traffic movements away from Main Street and its adjacent residential areas. In addition, a more direct connection between local roadways and the Charlestown Bridge would be achieved by separating Main and Chelsea Streets traffic from the predominant flow along Rutherford Avenue. To implement the plan satisfactorily, several minor traffic operational improvements of a supportive nature also would be performed on the Charlestown Bridge and at Keany Square and downtown Boston. This proposal is currently being

held in abeyance pending the outcome of studies to depress the expressway system through City Square. The long-range plan to depress the expressway is designed to alleviate the congestion on the expressway caused by a severe substandard weave section at the Tobin Bridge-I-93 intersection. Removal of this weave will do much to eliminate the current short-cutting which places heavy volumes of commuter traffic in City Square.

The presence of truck traffic on Charlestown's arterial streets is largely related to the industrial land uses which line the northerly edge of the community (Moran Terminal, Domino Sugar, Revere Sugar, etc.). As long as these land uses continue to be active, the demand for truck access to them will exist.

Deficiencies of Existing Facilities

(1) Existing Problems

Within the context of traffic circulation, access, and safety, the Charlestown arterial street system exhibits two major problems - the lack of a good crosstown route, resulting in poor access to the northern end of the Shipyard and the Moran Terminal area, and inefficient traffic operations in City Square due to the complexity of the entering streets and the lack of an effective signalization-channelization scheme.

(2) Future Problems

The planned redevelopment of the former Charlestown Naval Shipyard, the establishment of a National Park site on the most historic

portion of the Yard, and the possible expansion of the Moran Terminal will generate significant increases in traffic demand in Charlestown. However, the proposed Chelsea-Water Streets Connector and the Little Mystic Bridge (presently anticipated to be completed by 1980) will do much to alleviate the existing traffic congestion in the City Square area and sections of Lowney Way, Chelsea Street, lower Bunker Hill Street and Vine Street. This project will establish a new, and far superior, crosstown route to serve both the planned land uses at the National Park and the Shipyard and the Charlestown residential community. Replacing the present relatively low-capacity circuitous Chelsea/Lowney Way crosstown route, the new connector would tie directly into the Water Street bridge approach off-ramp and connect via Chamber, Front, and Joiner Streets to City Square, the Charlestown Bridge, Rutherford Avenue, the Expressway off-ramp at Park Street, and the Tobin Bridge off-ramp at Henley Street. As a result, projected 1995 traffic demand (P.M. peak hour) on Lowney Way would be reduced from 2,310 vehicles (if the Connector were not built) to less than 200 vehicles. Heavy truck traffic would be reduced by 86%. Thus, infiltration of heavy volumes of Shipyard-generated traffic into residential areas is not expected when these projects are completed.

Public Transportation

At the present time, there is no direct convenient public transportation access to the proposed Navy Yard development site. The Charlestown community is served by two stations on the MBTA Orange Line rapid

transit service, which runs in a north-south direction from Forest Hills to Malden. The closest station to the Shipyard is the Community College Station near the Prison Point Bridge which serves the College as well as areas in the southeastern section of Charlestown and is a 20-minute walk (approximately one mile) from the project site. The Sullivan Square Station is further to the north and serves the northwestern sections of the community. Convenient downtown transfer points connect the Orange Line with service to the south, west and northwest suburbs of Boston. The Blue Line connection at State Street provides direct access to and from Logan Airport in East Boston and communities to the northeast.

MBTA bus service in Charlestown consists of two routes (92 and 93) connecting Sullivan Square with City Square and Haymarket Square via Main Street and via Bunker Hill-Chelsea Streets. Route 111 provides service between Haymarket Square and Revere via City Square and the Tobin Bridge with a stop near Gate 1 to the Navy Yard before proceeding on the bridge.



Table IV.B.1:

Public Transportation Service - Charlestown

	<u>Trip Time</u>	<u>Rush Hours</u>	<u>Approximate Frequency (Minutes)</u>				<u>Sun</u>
			<u>Day</u>	<u>Night</u>	<u>Sat.</u>		
Orange Line Rapid Transit (Malden- Forest Hills)	-	4	8	13	8		1
Bus Routes							
92 Sullivan-Haymarket via Main Street	15	30	30	30	30		3
93 Sullivan-Haymarket via Bunker Hill Street	14	9	30	30	25		3
111 Woodlawn-Haymarket	17	6	18	25	15		7

Parking

At the present time, there are no specifically identified parking facilities within the project site. Parking is, and in the past was, provided on-street and on paved areas within the Shipyard which were not required for storage or other purposes. Parking for the National Historic Park is provided on-street in the vicinity of the Park and on surface lots near Gate 1 and under the Tobin Bridge (between Medford Street and Vine Street).

Pedestrian Access

The only pedestrian access to the National Park and the Shipyard site at this time is Gate 1 off Water Street.

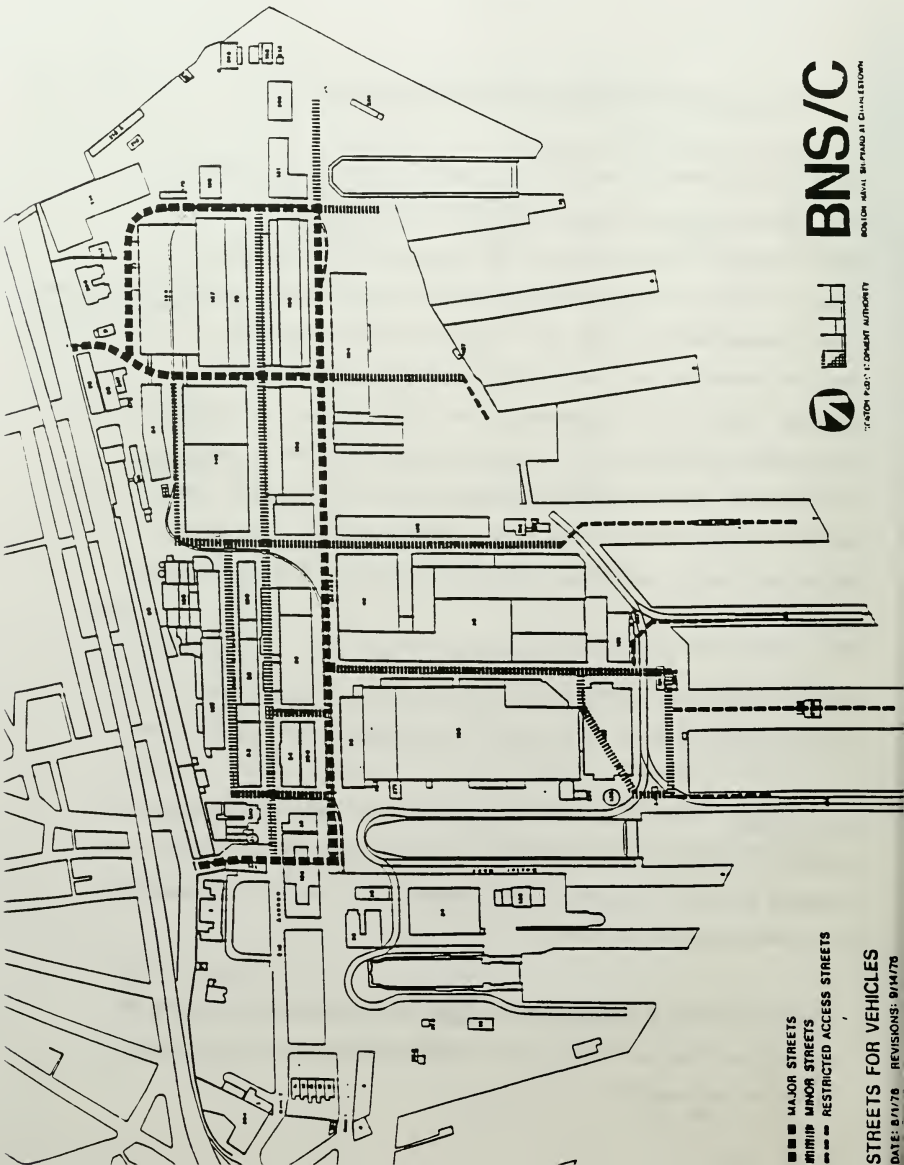
2. Proposed Vehicular Access and Traffic Circulation

With the establishment of the USS Constitution National Historic Park, Gates 1 and 2 off Water Street and Henley Street will be closed to all through vehicular traffic as part of the National Park Service policy to create a pedestrian environment relatively free from vehicular traffic within the National Park site. As a result, vehicular access to the Navy Yard development will be provided from Chelsea Street at two locations - Gate 4 at the northwest corner of the National Park and Gate 5 near Medford Street. Gate 5 is designed as the principal access point for automobile and service vehicles into and out of the Shipyard area and will directly connect to the major parking facilities for the Yard and National Park. Controlled automobile access will be allowed through Gate 4.

Within the Shipyard, the internal vehicular circulation system will restrict major traffic flow to the following streets (see Figure IV.B.4).

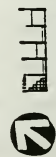
First Avenue - the principal circulation spine for the entire Shipyard, connecting the Gate 4 access road to Sixteenth Street and serving the National Historic Park, the Historic Monument Area, the New Development Area, and the Waterfront Park.

Thirteenth Street - Sixteenth Street Loop routine access from Gate 5 to the major parking facilities, the new housing development, and the uses in the northerly portion of the Yard.



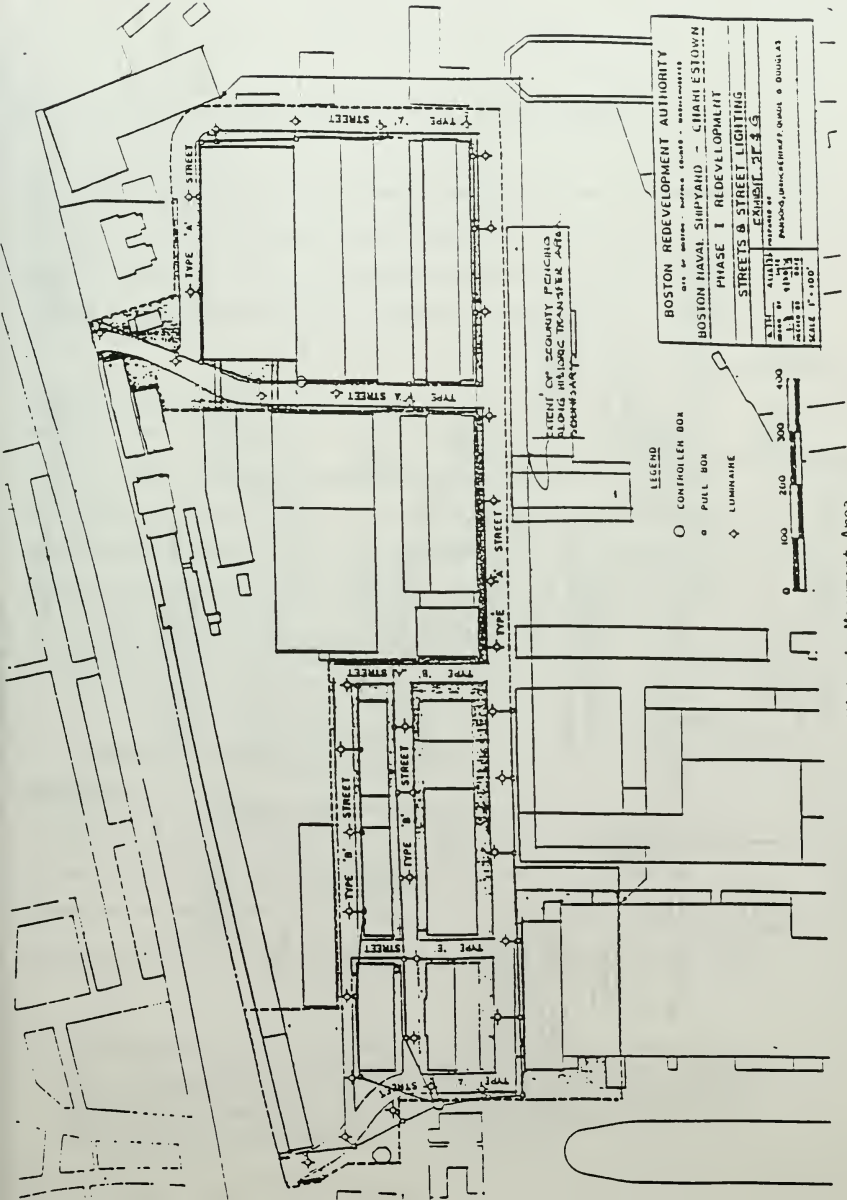
■■■ MAJOR STREETS
 ■■■■ MINOR STREETS
 - - - - RESTRICTED ACCESS STREETS

STREETS FOR VEHICLES
 DATE: 8/1/78 REVISIONS: 9/14/78



BNS/C
 BNS LOW-MOUNT SIGNAGE AT CHICAGO STATION

CHICAGO TRANSIT AUTHORITY
 "STATION PUBLIC INFORMATION AUTHORITY"



IV.B.5: Proposed Streets and Street Lighting - Historic Monument Area

Gate 4 Access a new street to connect Gate 4 to First Avenue.

Other streets within the Historic Monument Area and the New Development Area will be treated so as to reduce and slow vehicular traffic and encourage pedestrian activity. Restricted access streets also will be provided to the marinas and along the housing piers.

Pedestrian Access

The major pedestrian access point to the project area will be Gate 4, opposite Tremont Street. Additional access will be provided at Gate 1 and through the National Historic Park and at a new pedestrian entrance opposite Medford Street. Within the Shipyard will be an extensive pedestrian circulation system throughout the site and along the waterfront (for a more detailed description, see Part IV-G, Open Space/ Recreation).

3. Impact of the Project and Alternatives

Methodology

In order to determine the impact of the proposed development and its alternatives on the circulation system in the areas of Charlestown bordering the Navy Yard site, a detailed traffic analysis, based on existing studies,¹ was undertaken and is evaluated below. To facilitate

¹ The primary studies utilized were: (1) Wallace, Floyd, Ellenzweig, Inc., et al, Land Use and Transportation Study - Boston Naval Shipyard, Phase II Report, July 1974, and (2) Federal Highway Administration and Massachusetts Department of Public Works, Draft Negative Declaration, Chelsea-Water Streets Connector..., (1976).

comparision, the impacts of the proposed development program and the four alternative actions, described in Part III, are considered together.

The basic elements of the analysis include the following:

- (1) Trip-generation analysis - estimates of average daily and peak hour trips that would be generated by the development options were prepared, based upon the proposed site plans, traffic generation data obtained from similar developments, and detailed information concerning Boston area travel habits.
- (2) Directions of approach - the directions from which future trips would approach (and depart from) the site were estimated from trip tables generated from regional transportation studies, City of Boston Cordon Count information, and 1990 travel projections made by the Massachusetts Department of Public Works.
- (3) Transit - auto mode utilization - person-trips generated were broken down into transit and auto modes based upon existing and expected trends in the area.
- (4) Traffic - assignments - site generated traffic was assigned to the external street and expressway system serving the site based upon location of access points, the directional distribution, and the traffic generation analysis. Site traffic was combined with non-site generated traffic to analyze peak conditions.

- (5) Capacity analysis - based upon traffic assignments and roadway geometrics, capacity analyses were carried out to determine the adequacy of the existing and proposed roadway system.

Traffic Generation and Assignment¹

Table IV.B.2 indicates the total average daily traffic that would be generated by the proposed Shipyard reuse project and the different levels of development of the alternatives considered. Traffic is assigned to routes (Table IV.B.3) according to estimated directions of approach as indicated on Table IV.B.4. In all cases, it has been assumed that the preferred Chelsea-Water Streets connection was in operation.

According to the traffic generation analysis, the proposed development project would generate the greatest amount of total average daily traffic volumes - some 18,780 vehicles. Each of the alternative development options would produce considerably lesser amounts of daily traffic, from 74% of the proposed project-generated traffic for the housing/industrial/institutional development option to 17% for the "no-build" alternative. Of the traffic generated by reuse of the Shipyard site, it is estimated that approximately 10% would be trucks and buses, although this percentage could be slightly higher for alternatives with more intense industrial development.

¹ For assumptions used in traffic generation and assignment analyses, see Appendix D.

Table IV.B.2: Site Generated Average Daily Traffic (1990)
by type of Land Use
Charlestown Navy Yard Development¹

<u>Land-Use</u>	<u>Proposed Development</u>	<u>No Build</u>	<u>Alternatives</u>		
			<u>Housing/ Industrial/ Inst. Option</u>	<u>Industrial/ Inst. Option</u>	<u>Shipyard Reuse</u>
Housing	7,500	-	2,500	-	-
Institutions	4,220	-	6,160	6,180	-
Retail/Office	1,060	-	950	940	-
Hotel	3,000	-	2,000	600	-
Industry	1,250	2,000	740	1,570	6,380
Marina	550	-	300	-	-
National Park	<u>1,200</u>	<u>1,200</u>	<u>1,200</u>	<u>1,200</u>	<u>1,200</u>
TOTALS	18,780	3,200	13,850	10,490	7,580

¹Total trips in and out of project site, based on predominant trip purpose. Trip generation figures based on Institute of Traffic Engineers, Transportation and Traffic Engineering Handbook, Prentice-Hall, Inc. Englewood Cliffs, New Jersey, 1976.

Source: Boston Redevelopment Authority.

Table IV.B.3: Site Generated Average Daily Traffic (1990)
by Route
Charlestown Navy Yard Development¹

<u>Route</u>	<u>Proposed Development</u>	<u>No Build</u>	<u>Alternatives</u>		
			<u>Housing/ Industrial/ Inst. Option</u>	<u>Industrial/ Inst. Option</u>	<u>Ship Reuse</u>
Tobin Bridge (I-95)	1,880	290	1,250	940	680
I-93/Rutherford	1,880	320	1,390	1,160	760
Prison Point Bridge	1,880	320	1,250	1,040	760
Charlestown Bridge	3,940	450	2,220	1,260	1,060
Storrow Drive	1,880	450	1,930	1,470	1,060
Mass. Turnpike (I-90)	750	190	830	630	480
Southeast Expressway	2,360	640	2,360	2,210	-1,580
CBD via Central Artery	1,120	90	550	310	210
Local Charlestown	<u>2,820</u>	<u>450</u>	<u>2,070</u>	<u>1,470</u>	<u>1,060</u>
TOTALS	18,780	3,200	13,850	10,490	7,580

¹Total trips in and out of project site.

The 1990 p.m. peak hour traffic analysis is summarized in Table IV.B.5, which presents the estimated site-generated two-way traffic volumes according to route assignments.¹ Figures IV.B.7.a through IV.B.7.f. show the peak-hour traffic assignments to the transportation network in the Charlestown vicinity. Evaluation of the capacity of these streets with projected 1990 volumes, including traffic generated from the Navy Yard site development follows.

Capacity Analysis

With the one exception as noted below, the proposed development program for the Navy Yard is not expected to result in any capacity problems on the Charlestown street network. In general, the major arterials will be able to handle projected increases from site-generated traffic, as well as normal traffic increases, without any difficulty. The vast majority of the Navy Yard traffic is expected to utilize the expressway system and the improved Chelsea-Water Streets connection rather than the local street network. Implementation of the Chelsea-Water Streets Connector will provide good accessibility for vehicles to the regional expressway system and will discourage site traffic from penetrating the adjacent residential neighborhoods, as well as significantly reduce traffic on Lowney Way.² While traffic volumes in the City Square area are expected

¹ A.M. peak-hour volumes are similar to p.m., but flow in the opposite directions. P.M. peak-hour has been chosen for analysis since generally this represents the "worst case" situation.

² If the Chelsea-Water Streets Connector were not built, any redevelopment of the Shipyard would result in overflow demand, further exacerbation of existing problems with traffic on residential streets such as Lowney Way and Medford Street, additional traffic intrusion into residential areas, and longer peak periods than now exist. Such potential traffic congestion could cause a rejection of some of the development proposals for the Yard. For further analysis of a "no-build" Chelsea-Water Streets alternative, see FHWA/Mass DPW, Draft Negative Declaration Chelsea-Water Streets Connector.... Ch. 5A.

Table IV.B.4:

Directions of Approach
Charlestown Navy Yard Development

Route	<u>Alternatives</u>				
	<u>Proposed Development</u>	<u>No Build</u>	<u>Housing/ Industrial/ Inst. Option</u>	<u>Industrial/ Inst. Option</u>	<u>Shipyard Reuse</u>
Tobin Bridge (I-95)	10%	9%	9%	9%	9%
I-93/Rutherford	10%	10%	10%	11%	10%
Prison Point Bridge	10%	10%	9%	10%	10%
Charlestown Bridge	21%	14%	16%	12%	14%
Storrow Drive	10%	14%	14%	14%	14%
Mass. Turnpike (I-90)	4%	6%	6%	6%	6%
Southeast Expressway	14%	20%	17%	21%	20%
CBD via Central Artery	6%	3%	4%	3%	3%
Local Charlestown	15%	14%	15%	14%	14%

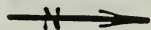
Table IV.B.5:

1990 P.M. Peak-Hour Traffic Generation
Charlestown Navy Yard Development

Route	<u>Alternatives</u>								
	<u>Proposed Development</u>		<u>No Build</u>		<u>Housing/ Industrial/ Inst. Option</u>		<u>Industrial/ Inst. Option</u>		<u>Shipyard Reuse</u>
	<u>In</u>	<u>Out</u>	<u>In</u>	<u>Out</u>	<u>In</u>	<u>Out</u>	<u>In</u>	<u>Out</u>	
Tobin Bridge (I-95)	105	130	9	26	60	97	33	85	22
I-93/Rutherford	105	130	10	28	66	108	40	105	25
Prison Point Bridge	105	130	10	28	60	97	36	95	25
Charlestown Bridge	220	273	14	40	106	172	44	114	35
Storrow Drive	105	130	14	40	92	150	51	133	35
Mass. Turnpike (I-90)	42	52	6	17	40	64	22	57	15
Southeast Expressway	147	182	20	57	112	183	77	200	50
CBD via Central Artery	63	78	3	9	26	43	11	28	8
Local Charlestown	158	195	14	40	98	161	51	133	35
TOTALS	1050	1300	100	285	660	1075	365	950	250



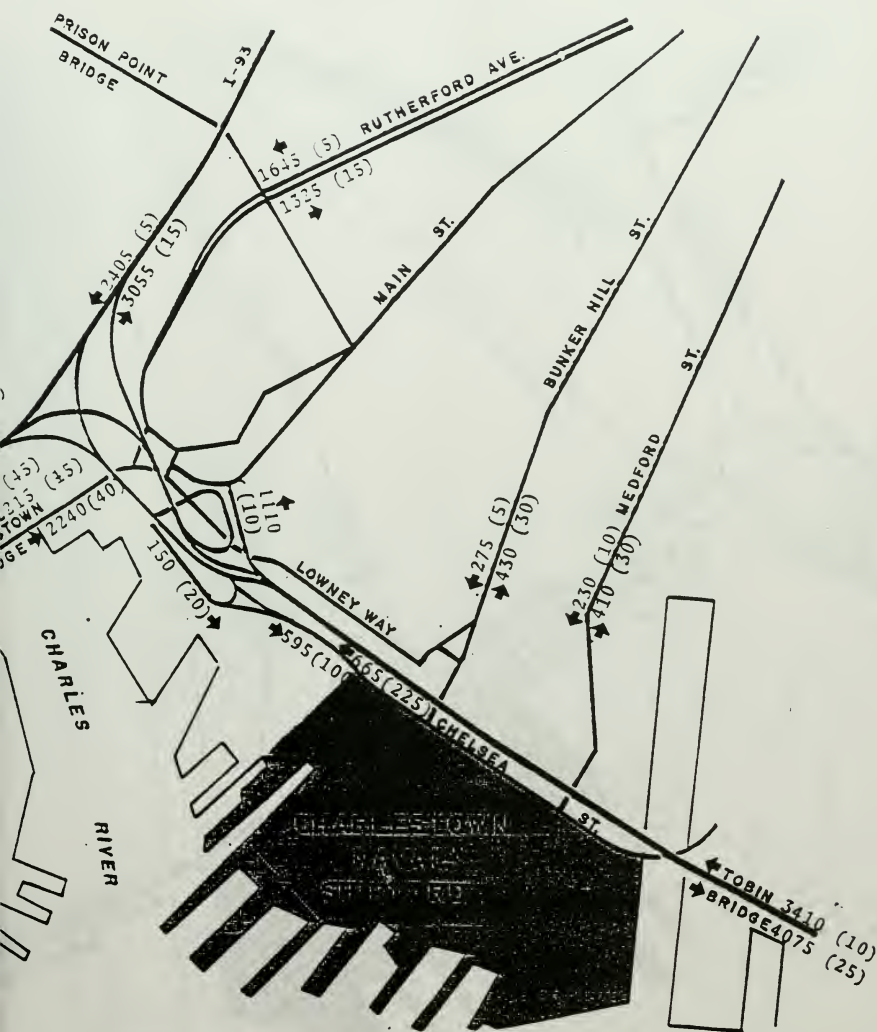
CHARLESTOWN NAVAL SHIPYARD
PEAK HOUR TRAFFIC VOLUMES



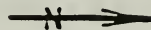


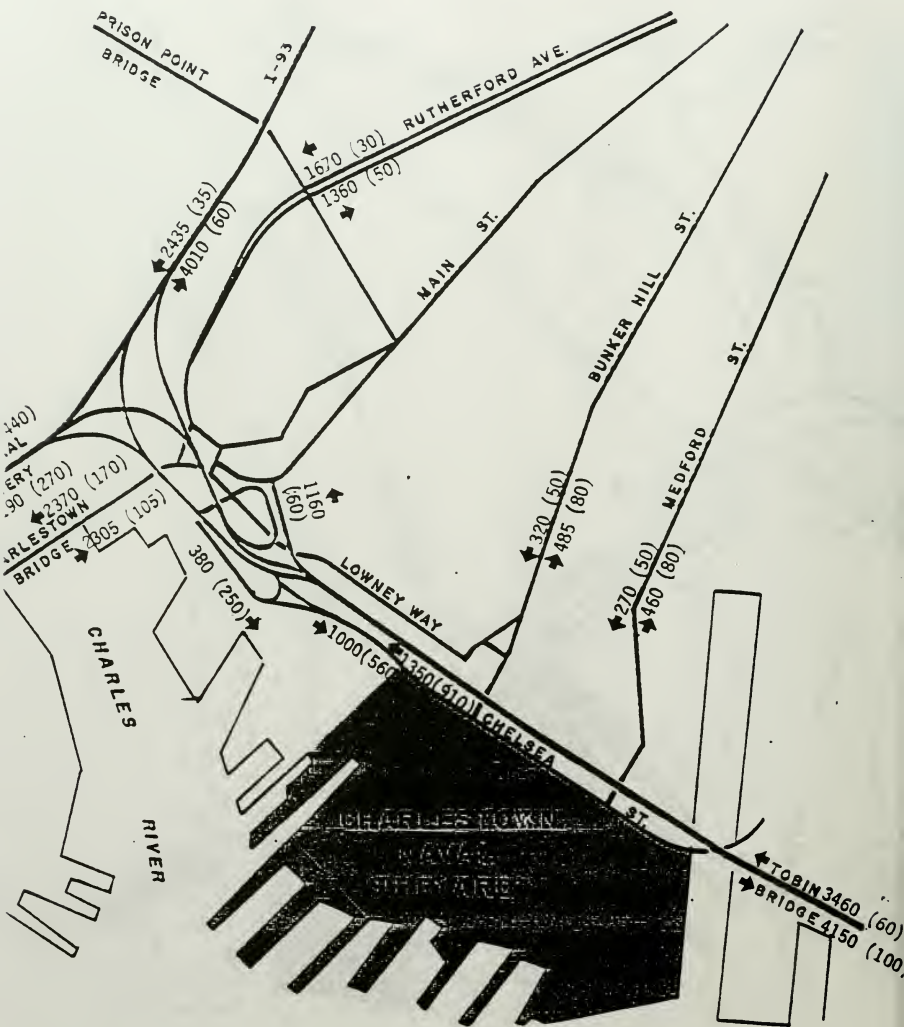
CHARLESTOWN NAVAL SHIPYARD
M. PEAK HOUR TRAFFIC VOLUMES



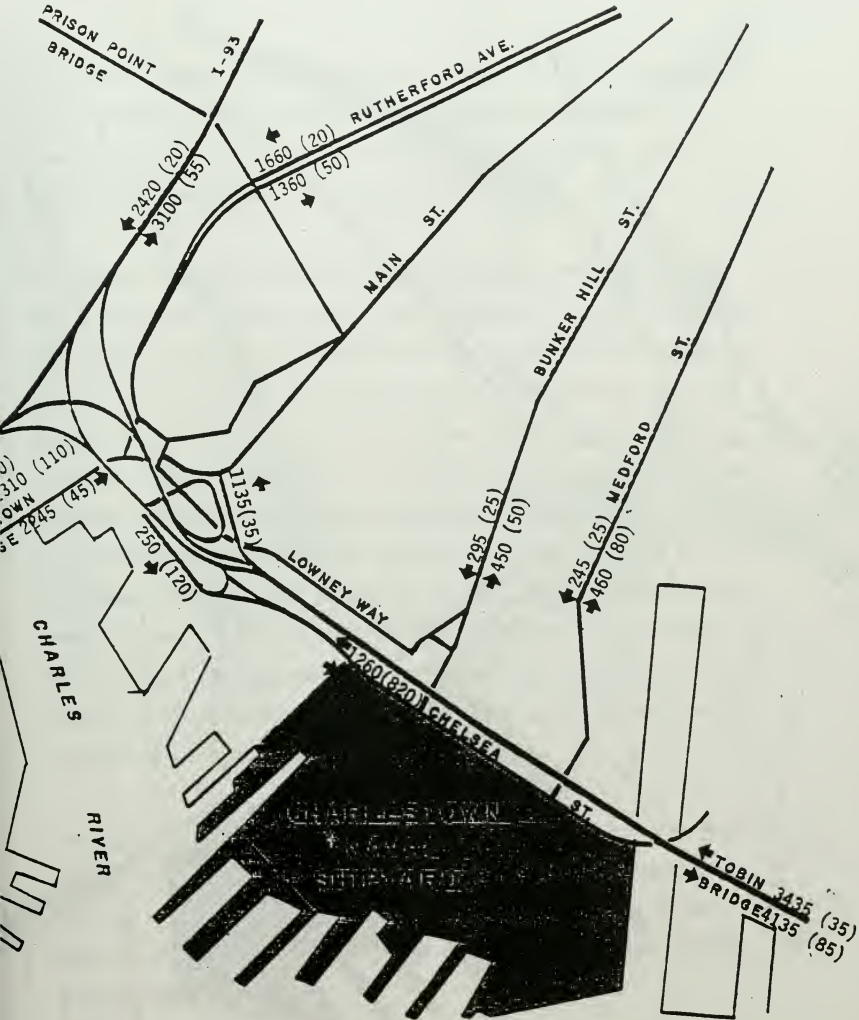


CHARLESTOWN NAVAL SHIPYARD
PEAK HOUR TRAFFIC VOLUMES



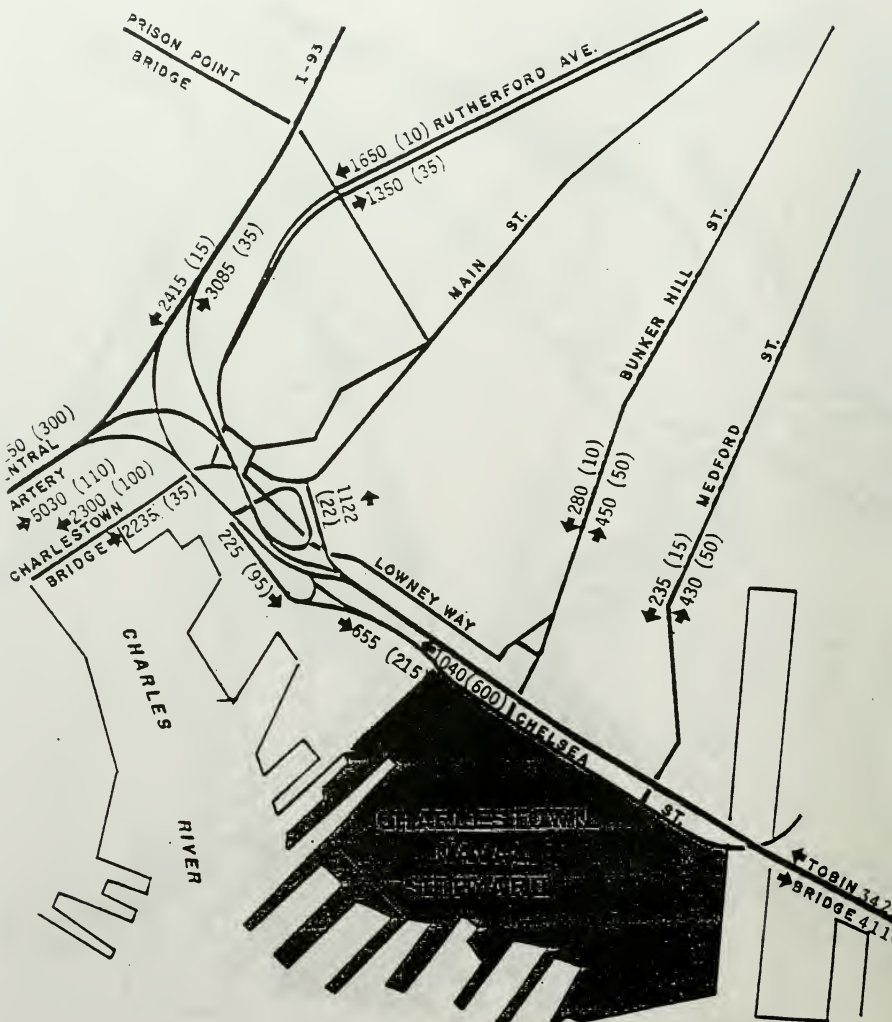


HARLESTOWN NAVAL SHIPYARD
M. PEAK HOUR TRAFFIC VOLUMES

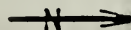


CHARLESTOWN NAVAL SHIPYARD
PEAK HOUR TRAFFIC VOLUMES





CHARLESTOWN NAVAL SHIPYARD
E.M. PEAK HOUR TRAFFIC VOLUMES



to increase by approximately 650 vehicles in the peak hour (an increase of approximately 15%), the construction of the Chelsea-Water Streets Connector and other improvements proposed by the BRA for City Square should provide ample capacity to absorb this projected growth.

The regional expressway system is presently capacity-restrained during peak periods, and intensive reuse of the Shipyard will further aggravate this problem (however, site-generated traffic is estimated to provide only 8% of the projected 1990 Central Artery traffic and only 3% of the Tobin Bridge traffic). The existing problems and any future traffic increases have been recognized by the Commonwealth and the BRA for some time, and future highway improvements to eliminate the present congestion and overloading, including the depression of the Central Artery in the City Square area, are under serious study. The Commonwealth already has committed over \$300 million from the U.S. Department of Transportation for design work and construction of improvements to the Central Artery system, including the Charlestown section, contingent upon expected satisfactory environmental assessment.

The alternatives to the proposed development project, since they involve considerably lesser traffic generation, likewise are not expected to cause any capacity problems on the local Charlestown street system. They also would add a lesser burden to the expressway system than the proposed project.

Current development plans for the Shipyard call for access to the Yard through Gates 4 and 5 from Chelsea Street. In order to determine the adequacy of these gates to handle site-generated traffic, a capacity analysis for these two gates was performed, with the following assumptions:

1. A 50-50 split of traffic to and from the Navy Yard between Gates 4 and 5.¹
2. Traffic to and from Bunker Hill/Vine Streets will use Gate 4 and traffic to and from Medford Street will use Gate 5.
3. National Park destined buses will use Gate 4 only.

Results of this analysis are presented in the following table.

Table IV.B.6:

Gate 4 Volume/Capacity Analysis
(P.M. Peak Hour)

	Proposed Project	No Build	<u>Alternatives</u>		Ship Rev
			Housing/ Industrial/ Institutional Option	Industrial/ Institutional Option	
Volume*	3,085	1,005	2,480	2,095	1.7
Capacity*	2,470	2,470	2,470	2,470	2.4
V/C Ratio	1.25	.41	1.00	.85	.

*Total volume and capacity on Chelsea Street, including site-generated and through-traffic.

¹ Although the actual split is expected to put a greater load on Gate 5, until final plans are completed for parking and bus access to the site, this assumption represents a "worst case" analysis for the Gate 4-Chelsea Street intersection.

Using the above assumptions, a capacity problem would exist at Gate 4 under the proposed development project. During the p.m. peak hour, the intersection of Gate 4 with Chelsea Street would be approximately 25% over capacity. There are, however, two relatively simple means of overcoming this problem. One would be to prohibit left turns from Chelsea Street southbound into Gate 4, which would result in a shift of 80 vehicles from Gate 4 to Gate 5. As an alternative, a minor widening of Chelsea Street to provide a left turn lane from Chelsea Street westbound into the Shipyard also would serve to eliminate capacity restrictions. In addition, the implementation of management controls and adequate signing to emphasize the use of Gate 5 for traffic destined to the Yard's parking facilities in Buildings 149 and 199 can further reduce the Gate 4 capacity problem.

With management controls to emphasize Gate 5 and prohibition of left-turn movements into the Shipyard from Chelsea Street at Gate 4, all volume/capacity ratios at Gates 4 and 5 would be well below 1.0, the point at which congestion occurs (see Table IV.B.7). Consequently, no congestion would be anticipated along Chelsea Street for the proposed project or any of the alternatives.

Table IV.B.7:

Volume/Capacity Analyses (P.M. Peak Hour)
With Management and Operational Controls

	<u>Alternatives</u>				
	<u>Proposed Project</u>	<u>No Build</u>	<u>Housing/Industrial/Institutional Option</u>	<u>Industrial/Institutional Option</u>	<u>Shipyard Reuse</u>
			<u>Gate 4</u>		
Volume*	3,005	1,100	2,430	2,070	1,700
Capacity*	~~3,535~~	3,535	3,535	3,535	3,535
V/C Ratio	.85	.28	.69	.58	.48
			<u>Gate 5</u>		
Volume*	1,255	285	915	680	400
Capacity*	3,535	3,535	3,535	3,535	3,535
V/C Ratio	.36	.08	.26	.19	.11

* Total volume and capacity on Chelsea Street, including site-generated and through traffic.

Public Transportation

As noted previously, the Navy Yard site is not at present particularly well-served by public transportation facilities. The recent opening of the new Haymarket North rapid transit line and the demolition of the elevated MBTA structure along Main Street have introduced the need for greatly-improved bus linkages to serve the Shipyard. In particular, the following observations can be made:

1. A link to the new Community College MBTA station is needed to serve long-distance work trips to the Shipyard site.
2. Residential land uses on the site require a strong link to downtown Boston.

Full development of the Navy Yard under the proposed development program is estimated to result in a p.m. peak hour transit potential of 1,425 person trips (see Table IV.8.8), making the provision of a high level of public transportation services critical. To improve future public transit access to the Shipyard, consideration has been given towards establishing a new bus service to connect the Navy Yard to the rapid transit system in Charlestown, as well as establishing a shuttle bus operation between the Haymarket Square station near Government Center (served by two rapid transit lines and a large number of bus routes) and Gate 4 on Chelsea Street. This use of buses would allow for flexible scheduling and routing to meet the needs of the public. In addition, an existing rail spur which extends from the Community College Station to the Navy Yard could provide a route for an inexpensive public transit rail shuttle service between the MBTA stop and the National Park and Shipyard development. Implementation of such a shuttle service is, however, dependent on the willingness of the National Park Service to allow rail service through the National Historic Park. The development of a water taxi ferry service, linking the Shipyard to downtown Boston, the Harbor Islands, and the South Shore, and serving both the site residents and day visitors to the National Park and other attractions in the Yard, also has been proposed. Implementation of these proposals would do much to overcome the site's present lack of accessibility to public transportation facilities.

Table IV.B.8: Public Transit Generation (Person Trips)
Charlestown Navy Yard Development
(P.M. Peak Hour)

<u>Land-Use</u>	<u>Proposed Development</u>	<u>No Build</u>	<u>Alternatives</u>		
			<u>Housing/ Industrial/ Inst. Option</u>	<u>Industrial/ Inst. Option</u>	<u>Shipyard Reuse</u>
Housing	585	-	195	-	-
Institutions	465	-	515	1,065	-
Retail/Office	100	-	200	35	-
Hotel	35	-	35	20	-
Industry	125	245	150	440	490
Marina	-	-	-	-	-
National Park	<u>290</u>	<u>290</u>	<u>290</u>	<u>290</u>	<u>290</u>
Totals*	1,425	535	1,055	1,595	780

* Totals may be smaller than sum of individual generations due to very significant overlap of generation by the various land uses.

Source: Wallace, et al, Land Use and Transportation Study, Boston Naval Shipyard Phase II Report, 1974, Section IV; Boston Redevelopment Authority.

Table IV.8.9: Parking Requirements
Charlestown Navy Yard Development

<u>Land-Use</u>	<u>Proposed Development</u>	<u>No Build</u>	<u>Alternatives</u>		
			<u>Housing/ Industrial/ Inst. Option</u>	<u>Industrial/ Inst. Option</u>	<u>Shipyard Reuse</u>
Housing	1,775	-	600	-	-
Institutions	700	-	750	630	-
Retail/Office	535	-	535	155	-
Hotel	550	-	300	150	-
Industry	300	350	225	650	750
Marina	275	-	150	-	-
National Park	<u>400</u>	<u>400</u>	<u>400</u>	<u>400</u>	<u>400</u>
Totals*	3,500	750	2,340	1,605	1,100

* Totals may be smaller than sum of individual generations due to very significant overlap of generation by the various land uses.

Source: Wallace, et al, Land Use and Transportation Study, Boston Naval Shipyard, Phase II Report, 1974, Section IV; Boston Redevelopment Authority.

With the exception of the Industrial/Institutional option, which is estimated to have a considerably higher institutional-related demand for public transportation services, each of the alternatives result in a lesser requirement for public transit, although the need for adequate linkages still would exist. Transit generation of the alternatives is estimated to vary from 1,595 person trips for the Industrial/Institutional option to 535 person trips for the "no-build" option (see Table IV.B.8).

Parking

The total amount of on-site parking necessary to serve the different types and levels of development of the proposed project and the alternatives is presented in Table IV.B.9.

As this table indicates, the proposed development project will require a total of 3,500 parking spaces (including spaces to serve the National Historic Park) to accommodate vehicles (exclusive of buses) coming to the Navy Yard. These spaces will be provided in parking structures and lots situated at key locations throughout the Yard. The majority of the spaces (up to 2,000), serving primarily visitors to the National Park, the hotel/conference center, and the other attractions of the Yard, will be provided by the conversion of warehouse buildings 149 and 199 into public parking structures. At least 600 spaces are proposed for residents as an integral part of the new housing development. Present planning calls for townhouse parking to be provided in attached garages and for approximately 40% of the new mid-rise units to be included in the mid-rise structures. The remainder of the 600 spaces will be

located on surface lots or on-street, and residential parking not provided on-site will be included in the parking structures. It is estimated that a parking requirement of 1.2-1.5 cars per dwelling unit would be reasonable in the light of the location of the project site and the housing prices. Additional parking will be provided as part of the hotel/conference center as short-term curb-side parking on selected streets, and for marina patrons on Piers 4 and 6.

The large size of the project site and the ready convertibility of Buildings 149 and 199 would allow the parking requirements of the proposed development to be satisfied adequately, and without the necessity of constructing large-scale surface parking lots. Buildings 149 and 199, the site's major parking facilities, are directly accessible from Gate 5, through which the majority of vehicles destined to these facilities is expected to enter the Yard. They are also readily accessible to the National Historic Park via a major pedestrian path proposed along First and Second Avenues.

The two alternative development options likewise could adequately satisfy their parking requirements through a combination of structural and surface parking facilities. Under the Housing/Industrial/Institutional option, it was proposed to convert Building 149 into an 800 car parking structure to serve proposed institutional uses and the National Park, and a new 450 car facility was proposed to serve the hotel center and some of the retail/restaurant uses. Parking for the housing was proposed on-site, adjacent to the residences and as part of the buildings themselves.

The remaining parking demand (500 spaces) - for retail, marina, and industrial land uses - would be provided on several surface lots. In the Industrial/Institutional option, Building 199 was proposed to be converted to 800 spaces to serve the needs of the institutions and hotel and part of the retail and National Park demands. The remaining retail/commercial and the industrial requirements could be satisfied by scattered surface lots.

In the "no-build" and shipyard reconversion options, parking demand for uses within the project site would be fulfilled solely by surface parking lots. Neither of these alternatives however, would provide spaces for the National Park visitors. Park requirements could be partially satisfied by three small surface lots under the Tobin Bridge, with a combined capacity of approximately 300 cars, leaving 100 or more requiring on-street or alternative parking arrangements outside the project area.

IV.C. AIR QUALITY¹

1. Background

Among other factors, the air quality of an area is directly related to the quantity of various pollutants emitted into the local atmosphere. Pollutants are emitted by both moving sources - vehicles, trains, etc. - and by stationary sources, such as power plants, industries, and the heating and mechanical systems of buildings. The principal pollutants generated by transportation sources are carbon monoxide, unburned or partially-burned hydrocarbons, oxides of nitrogen, and particulate matter, the greatest quantity being contributed by gasoline-powered motor vehicles. Stationary sources produce principally sulfur dioxide and particulate matter; particulates also are generated by urban land uses such as incinerators, construction activities, and road dirt. Within the Charlestown Navy Yard, the greatest contaminant emissions are from transportation sources.

Because the emission of pollutants degrades the quality of the ambient air and causes adverse health effects on human beings and their environment, the U.S. Environmental Protection Agency (EPA), pursuant to the Clean Air Act, promulgated air quality standards for six airborne pollutants on April 13, 1971. These standards are shown on Table IV.C.1 and represent maximum pollutant exposure for which no adverse effect to public health (primary standard) or welfare (secondary standard) will occur. The target date for attainment of national primary standards was

¹ Much of the data and analyses contained in this section have been obtained from: FHWA/Mass DPW, Draft Negative Declaration, Chelsea-Water Streets Connector..., (1976), Chapter 5B and Appendix E.

Table IV.C.1
FEDERAL AND MASSACHUSETTS AIR QUALITY STANDARDS

Contaminant	Averaging Time	Concentration				Measurement Criteria*
		Primary ug/m ³	Std. ppm	Sec. ug/m ³	Std. ppm	
Sulfur Oxides (SO ₂)	Year	80	0.03	-	-	Arithmetic Mean
	Day	365	0.14	-	-	Maximum
	3 Hours	-	-	1,300	0.5	Maximum
Total Suspended Particulates (TSP)	Year	75	-	60**	-	Geometric Mean
	Day	260	-	150	-	Maximum
Carbon Monoxide (CO)	8 Hours	10,000	9	10,000	9	Maximum
	1 Hour	40,000	35	40,000	35	Maximum
Photochemical Oxidants (O ₃)	1 Hour	160	0.08	160	0.08	Maximum
Hydrocarbons (Non-Methane)	3 Hours	160 ⁺	0.24	160	0.24	Maximum between 6 a.m. and 9 a.m.
Nitrogen Oxides (NO ₂)	Year	100	0.05	100	0.05	Arithmetic Mean

* Standards other than those based on annual arithmetic or geometric mean are not to be exceeded more than once per year.

** For use as a guide in assessing implementation plans to achieve the 24-hour TSP standard.

+ For use as a guide in devising implementation plans to achieve the oxidant standard.

May 31, 1975, and for secondary standards, within a reasonable time period. For metropolitan Boston, achievement of the primary standards has been extended to May 31, 1977.

In order to meet the air quality standards, the EPA has promulgated controls and regulations respecting pollutant emissions from various sources, including the Federal Motor Vehicle Control Program (FMVCP) to limit motor vehicle emissions. Where these controls are inadequate to insure attainment or maintenance of ambient standards, more restrictive Transportation Control Plans (TCP) also have been required.

Since the EPA determined that the FMVCP was not adequate to attain air quality standards in metropolitan Boston by the applicable dates, a Transportation Control Plan was proposed in 1973 and was finally promulgated on June 12, 1975. The Plan is composed of a series of land use and transportation control procedures, which are summarized on Table IV.C.2. Under the Plan, the goal was set to reduce hydrocarbons by 60% throughout the region and carbon monoxide by as much as 51% depending upon the locality.

2. Current Air Quality

The basis for determining whether air quality levels are in compliance with standards is data collected from monitoring stations operated by the Massachusetts Air Surveillance Network throughout the metropolitan Boston area. The nearest operating station to the project area is located at Science Park in Cambridge. Current (1975) air quality levels

Table IV.C.2

SUMMARY OF THE REVISED METROPOLITAN BOSTON
TRANSPORTATION CONTROL PLAN*

Control Strategy	Project Date of Full Implementation
<u>I. SEMI-ANNUAL INSPECTION/MAINTENANCE PROGRAM</u>	
All Light- and Medium-Duty Vehicles (10,000 pounds gross vehicle weight or less)	August 1, 1976
<u>II. PARKING MANAGEMENT PROGRAM</u>	
A. Morning On-Street Parking Ban**	March 1, 1977
B. Commercial Off-Street Parking Freeze**	October 15, 1973
C. Restrictions on Construction or Modification of Parking Facilities	+
<u>III. COMMUTER AUTOMOBILE USE REDUCTION</u>	
A. Mandatory Incentive Measures by Commuter-Attracting Facilities++ to Reduce Single-Passenger Commuting Vehicle Usage by 25%	June 30, 1976
B. Computer Carpool Matching Program	June 30, 1975
C. Feasibility Study of Preferential Bus and Carpool Incentives	December 31, 1976
D. Study of Improved Bicycle Pathways and Facilities	June 30, 1976
<u>IV. CO "HOT SPOT" CONTROL STRATEGIES</u>	May 31, 1977
<u>V. ORGANIC SOLVENT USE REGULATIONS</u>	May 31, 1977

* Includes amendments proposed by EPA on June 12, 1975 (40FR25152, 40CFR52). All regulations refer to the Metropolitan Boston Intrastate Air Quality Control Region unless otherwise noted.

** Applies only to Boston proper and the City of Cambridge.

*** Applies only to the "freeze area" of Boston, the City of Cambridge, and Logan International Airport.

+ Reserved pending promulgation of final parking management regulations.

measured at this and other Boston area stations are summarized on Tables IV.C.3 and IV.C.4. Observational data from Science Park indicated that, with the exception of secondary TSP and 1-hour ozone standards, none of the Federal primary or secondary standards were exceeded during the year. Particulate levels throughout the Boston area are high, however, and violations of the primary standard have been measured at other sites. Although there are no recorded violations of the CO standards at the Science Park site, there were repeated violations of the 1-hour ozone standard, particularly during the summer months. Figure IV.C.1 shows maximum eight-hour ambient CO estimates for the project area vicinity for 1970.

Since CO is highly sensitive to location, a 60-day monitoring program was undertaken in the fall of 1975, in connection with a proposed Chelsea-Water Streets improvement near the Navy Yard, to establish existing CO levels in the project area. Monitoring equipment was installed on the roof of Building 204, adjacent to Gate 2 of the Shipyard, approximately 40 feet from the Tobin Bridge.¹ Maximum measured CO concentrations are shown on Table IV.C.5 below, which indicates that 1-hour and 8-hour CO standards were never exceeded at the site during the monitoring program.

¹ For details of testing, calibration, data validation, recording and analytical procedures, see FHWA/Mass DPW, op.cit., Appendix E.

Table IV.C.3: Air Quality Measurements - Boston AreaMonitoring Stations (Jan. - Dec. 1975)¹Total Suspended Particulates (ugm/M³)

<u>Station</u>	<u>Annual Geometric Mean¹</u>	<u>Max. 24-Hr. Conc.</u>	<u># Times Primary Standard² Exceeded²</u>	<u># Times Secondary Standard³ Exceeded³</u>
J.F.K. Federal Bldg.	61	145	0	0
Kenmore Square	99*	206	*	*
South Bay	63	150	0	0
Brookline H.S.	42	152	0	0
Science Park	68	150	0	0

1. Primary standard = 75 ugm/M³, Secondary = 60 ugm/M³2. Standard = 260 ugm/M³3. Standard = 150 ugm/M³

* Insufficient data available to meet averaging criteria for determination of violations

Nitrogen Oxides (PPM)

<u>Station</u>	<u>Annual Arithmetic Mean¹</u>
J.F.K. Federal Bldg.	.035
Kenmore Square	.053
South Bay	.028
Brookline H.S.	.030
Science Park	.038

1. Standard = 0.050 ppm

Sulphur Dioxide (PPM)

<u>Station</u>	<u>Annual Arithmetic Mean¹</u>	<u>Max. 24 Hr. Conc.</u>	<u># Times Standard² Exceeded²</u>
J.F.K. Federal Bldg.	.011	.044	0
Kenmore Square	.013	.059	0
South Bay	.007	.034	0
Brookline H.S.	.004	.027	0
Science Park	.010	.036	0

1. Standard = .03 ppm

2. Standard = .14 ppm

Table IV.C.4: Carbon Monoxide and Ozone Concentration
(PPM) Measured at Science Park
Monitoring Station - 1975¹

	<u>Carbon Monoxide</u>				<u>Ozone</u>	
	<u>Max. 1 Hr.</u> <u>Conc.</u>	<u>#Times 1-Hr.</u> <u>Standard</u> <u>Exceeded²</u>	<u>Max. 8-Hr.</u> <u>Average</u>	<u>#Times</u> <u>8-Hr. Std.</u> <u>Exceeded³</u>	<u>Max. 1-Hr.</u> <u>Conc.</u>	<u># Times</u> <u>1-Hr. Std.</u> <u>Exceeded⁴</u>
<u>Month</u>						
Jan.	8	0	5.8	0	.039	0
Feb.	13	0	7.4	0	.060	0
Mar.	10	0	5.8	0	.055	0
April	10	0	6.3	0	.100	2
May	10	0	5.6	0	.126	20
June	8	0	4.1	0	.158	37
July	7	0	4.9	0	.118	22
Aug.	8	0	5.6	0	.117	15
Sept.	9	0	5.4	0	.056	0
Oct.	12	0	7.3	0	.063	0
Nov.	13	0	6.6	0	.041	0
Dec.	10	0	7.5	0	-	-

1. Massachusetts Bureau of Air Quality Control, "Monthly Summary of Continuous Data."
2. Standard = 35 ppm
3. Standard = 9 ppm
4. Standard = 0.08 ppm

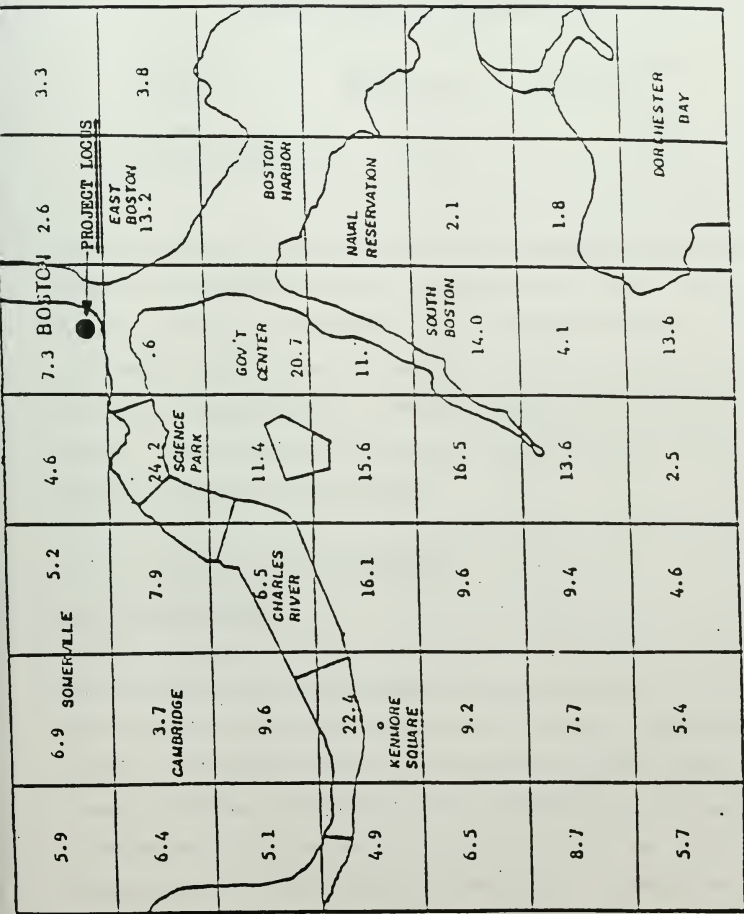


Figure IV.C.1: 8-Hour Maximum Ambient Air Quality Estimates for Carbon Monoxide in 1970 (In PPM)

Table IV.C.5: Maximum Measured CO Concentrations (ppm)
September 4, 1975 - November 4, 1975

<u>Averaging Period</u>	<u>Maximum Concentration</u>	<u>Federal & State Standards</u>
1-Hour	10.2	35
Running 8-Hour	5.1	9
Discrete 8-Hour	4.6	9

Statistical analysis of the measured data also suggested that no violations of the CO standards occurred at the site during 1975. A qualitative assessment of the measured 1-hour CO concentrations revealed that peak levels occurred, in general, between 7 and 9 a.m. and between 3:30 and 4:30 p.m., Monday through Friday, which time periods correspond roughly to the morning and evening rush hours, during which traffic levels on the Bridge are the highest.

3. Air Quality Impacts of the Project

Traffic-related Impacts

A traffic-related air quality analysis for 1985 and 1995 was prepared for the Chelsea-Water Streets Connector Negative Declaration and assumed full development of the Naval Shipyard, as well as the implementation of the Boston Transportation Control Plan and Federal vehicle emission control regulations according to their current schedules. The analysis of projected emissions was carried out on a local scale for carbon monoxide and on a regional scale for carbon monoxide, hydrocarbons, and nitrogen oxides.¹

¹ For a description of the analytic procedures and modeling techniques and details of the evaluations, see FHWA/Mass DPW, op.cit., Appendix E.

Future carbon monoxide concentrations were projected using the APRAC-1A urban diffusion model. Motor vehicle emission rates were computed using the subprogram VEHEMI. This model uses an EPA methodology to allow explicit representation of local vehicle mix and incorporates the results of recent studies of vehicle emissions. VEHEMI replaces an empirical equation in APRAC-1A which was previously used for this purpose. The model was calibrated by comparing its prediction for the monitoring period with observed values.

APRAC-1A requires a traffic data base structured on two levels: (1) a high-resolution primary network in the study area, and (2) a grid of area sources for traffic emissions from outside the study area. The first set of inputs came from the geometry of the future circulation system and from traffic volume predictions; the second set of inputs used information developed by EPA and others in preparing the Metropolitan Boston Transportation Control Plan.

One-hour and eight-hour maximum CO concentrations were calculated at seven sensitive receptor points. In each instance, the "worst-worst" case was assumed, i.e., a joint occurrence of peak traffic and most adverse meteorological conditions.

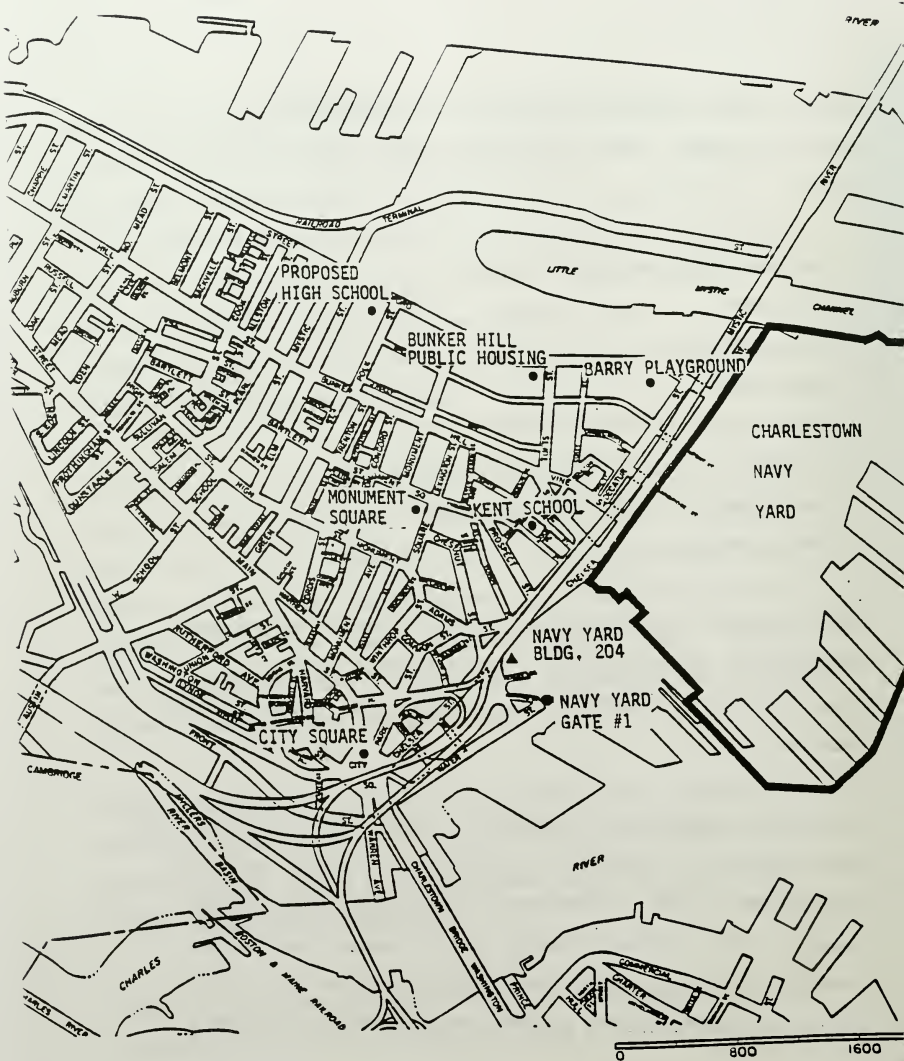
Because of the extremely localized effects of CO emissions, the seven selected receptor points are primarily located on streets which would

experience changes directly attributable to the implementation of proposed development. These receptor sites, shown in Figure IV.C.2, include:

1. Lexington Street near Monument Square
2. City Square
3. Navy Yard Gate 1
4. Kent School
5. Barry Playground (Chelsea & Medford Streets)
6. Proposed High School (Terminal & Medford Streets)
7. Public Housing (Tufts & Medford Streets)
8. Monitoring Site.

Since no single wind direction simultaneously produces the worst conditions at all receptor sites in a complex urban environment, the reported emissions projections are composites of the highest values at each site.

The results of the modeling simulation are given in Table IV.C.6 and are shown graphically in Figures IV.C.3 and IV.C.4. The table indicates that in 1985 and 1995, no exceedance of the 1-hour CO standard will occur and that the 8-hour CO standard will be exceeded only at City Square in both years. Within the Navy Yard itself, no violations of either the 1-hour or 8-hour standards are predicted by the modeling.



- ▲ Monitor Site
- Receptor Site

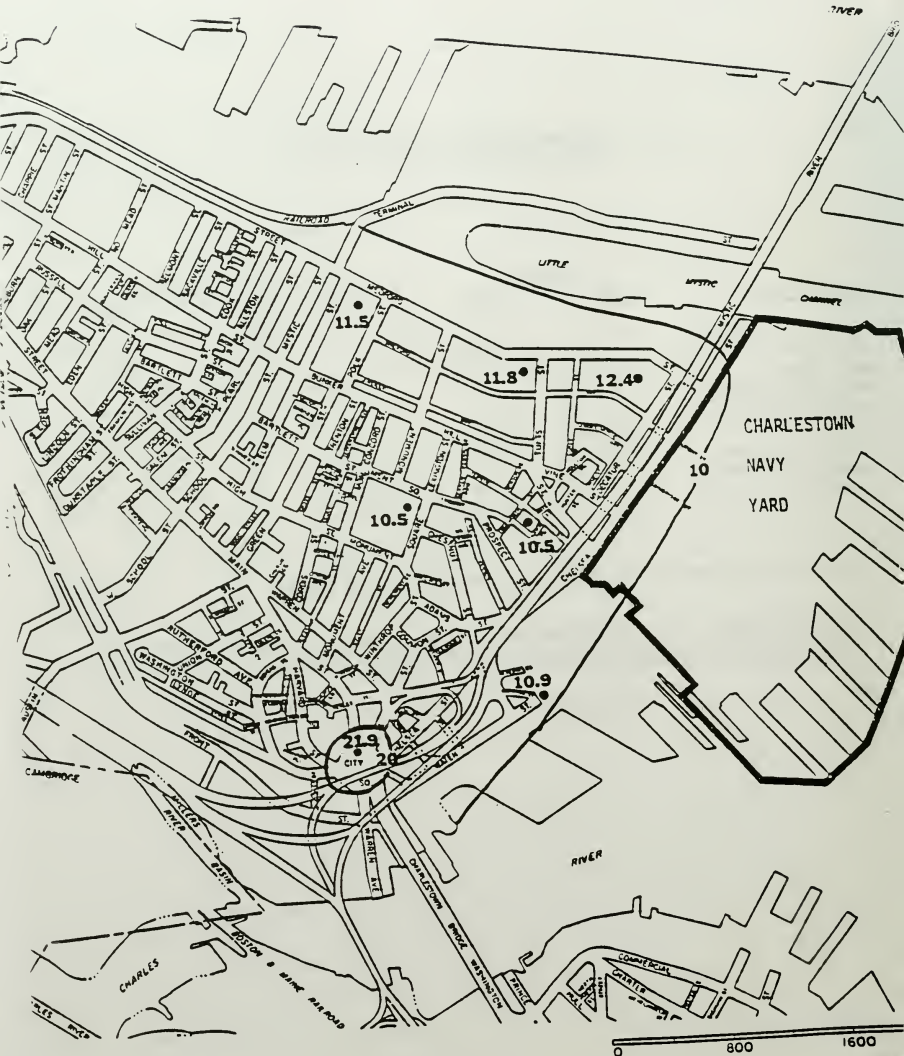
Figure IV.C.2: LOCATION OF CARBON MONOXIDE MONITORING AND RECEPTOR SITES

Table IV.C.6: Predicted Maximum One-Hour and Eight-Hour
CO Concentrations (ppm)*

<u>Receptor Site</u>	<u>One-Hour</u>		<u>Eight-Hour</u>	
	<u>1985</u>	<u>1995</u>	<u>1985</u>	<u>1995</u>
Bunker Hill Monument	10.5	11.0	6.0	6.3
City Square	21.9	23.6	12.6*	13.6*
Kent School	10.5	11.5	6.0	6.6
Navy Yard, Gate 1	10.9	18.6	6.3	8.9
Proposed High School Site	11.5	12.5	6.6	7.2
Barry Playground	12.4	13.0	7.1	7.5
Bunker Hill Housing Project	11.8	13.2	6.8	7.6

* Exceeds Massachusetts and Federal 8-hour standard of 9ppm.

¹ Federal Highway Administration/Massachusetts Department of Public Works,
Draft Negative Declaration, Chelsea-Water Streets Connector... (1976), p. 54.



00.0 Predicted Concentration at Receptor Site

—0— ppm isopleth

Figure IV.C.3.a:

WORST CASE ONE-HOUR CARBON MONOXIDE
CONCENTRATIONS (ppm), 1985



0 Predicted Concentration at Receptor Site

— ppm Isopleth

e IV.C.3.b:

WORST CASE ONE-HOUR CARBON MONOXIDE
CONCENTRATIONS (ppm), 1995





00.0 Predicted Concentration at Receptor Site

— 0 — ppm Isopleth

ure IV.C.4.a:

WORST CASE EIGHT-HOUR CARBON MONOXIDE
CONCENTRATIONS (ppm), 1985



0.0 Predicted Concentration at Receptor Site

-0- ppm isopleth

ure IV.C.4.b:

WORST CASE EIGHT-HOUR CARBON MONOXIDE
CONCENTRATIONS (ppm), 1995



Other Pollutant Projections

Estimates of total annual vehicular emissions of CO, HC, and NO_x from the primary link network also were prepared; results of this analysis are shown in Table IV.C.7.

Vehicle emissions of CO, NO_x, and HC will decrease sharply between 1976 and 1985 because of a shift to emission controlled vehicles and implementation of the Boston Transportation Control Plan. Total annual emissions of these pollutants will then increase somewhat between 1985 and 1995 as the number of vehicle miles travelled increases.

Table IV.C.7: CO, HC, and NO_x Emissions in Study Area
(100 tons/year)

	<u>CO</u>	<u>HC</u>	<u>NO_x</u>
1976	9.6	1.2	0.9
1985	4.0	0.5	0.4
1995	5.4	0.6	0.5

Short-Term Impacts

Short-term adverse impacts on air quality will occur during the 10-12 year construction period and result primarily from building demolitions, land clearance and excavation, construction activities, and emissions from construction equipment and trucks.

The most significant impact would be substantial increases in the amount of particulate matter, or fugitive dust released into the atmos-

phere, as a result of demolition, loading of the rubble into trucks, and grading of the vacant site, and from the movement and hauling of dirt during land clearance, site preparation, and excavation operations. Based on a previous study of demolition in the Boston area,¹ it is estimated that the proposed demolition of 32,928,000 cu. ft. of buildings within the Navy Yard would produce a total of 343.2 tons of particulate matter. In addition, it is estimated that land clearance and excavation activities will involve the movement of approximately 140,000 cu. yds. of earth, which would add an estimated 280 tons of dust to the atmosphere (based on EPA emission factor of 4 lbs./cu. yd.). These amounts of dust would be added to ambient particulate levels, which levels, as noted above, are already high in the Boston area and do violate standards. However, the demolition would be spread over the several years of the project rather than occurring at the same time. It is currently estimated that approximately one-third of the demolition (by volume) would occur during the first year of the project to prepare the waterfront park site.

Assuming that all proposed demolition will be completed within the first five years of the development, and that one-half of the land clearance and excavation activities will be undertaken during the same period, the maximum annual increase in particulate matter from these activities is

¹ Resource Planning Associates, Inc., Final Environmental Impact Statement for the Clearance of Unsafe Buildings, Community Development Block Grant Program (City of Boston), Cambridge, MA, January, 1976. According to this study, demolition of a brick structure would produce 6.7 lbs. of dust per ton of demolition waste. Total demolition weight of the buildings to be demolished is estimated at 102,440 tons.

estimated at an average of 97 tons, or approximately 8 tons per month. When compared to the estimated dustfall for the City of Boston of 45 tons per square mile per month, the dustfall from this project would represent an increase of nearly 18% over ambient conditions for the square mile grid surrounding the Navy Yard.

The above figures assume no control of dust during demolition and construction operations. With the use of extensive or continuous wetting (use of water spray) throughout the demolition and rubble-removal process, however, dust levels can be reduced by as much as 80%. Average control (intermittant wetting, with the most intensive wetting occurring during the actual razing of a structure) can result in a 50% reduction of dust generation. Also, the watering down of exposed ground areas and the application of chemical compounds, such as calcium chloride, can substantially reduce dust during the land clearance and excavation phases. It should be noted, however, that the expected particulate problem is common for construction projects of the size contemplated and should not be considered unique to this project.

Although the values indicated above are high, even with extensive control, the significance of the impact would be tempered by several considerations. The Boston demolition study found that approximately 90% of demolition - generated particulate matter settled to the ground in the immediate vicinity of the demolition site and was not dispersed into the atmosphere, the dust plume created generally being impeded both horizontally and vertically by the presence of neighboring buildings.

Thus the greatest impact would be confined generally to receptors in the vicinity of the demolition activities and most likely would involve the soiling of exterior surfaces. Moreover, evaluation of particle size indicated that only 10% of the particulates were 10 microns or smaller in diameter, which size is respirable and thus could be hazardous to human health. The same characteristics would apply equally to fugitive dust from excavation activities. The impact of dust generation also will be minimized by the fact that the period of greatest generation will occur prior to substantial development or occupancy of the Shipyard.

Some additional particulate matter will be generated as a result of the actual construction process itself. The amount that might be produced cannot be estimated at this time but is expected to be considerably less than that resulting from demolition and excavation activities.

Asbestos, which has been found to be extremely dangerous to health, possibly may be present in a friable, or free-floating, state as insulation or fire proofing material in some of the buildings planned for demolition. Where present, procedures as outlined in the National Emission Standards for Asbestos¹ will be enforced to minimize any potential adverse impacts.

Air quality also will be impacted by increased gaseous emissions from heavy- and light-duty trucks, from gasoline- and diesel-operated construction machinery, and from asphalt paving operations. These equipment

¹ 38 FR 8820, as amended May 3, 1974 (39 FR 15396).

would generate primarily carbon monoxide, hydrocarbons, and nitrogen oxides, with lesser amounts of sulfur oxides and particulates (see Table IV.C.3), which would be spread over the 10-12 year construction period estimated for the proposed development. The amount of the pollutants which might be generated cannot be estimated with any accuracy at this time, being dependant in great part on the number of trucks and equipment in operation at one time.

Long-Term Impacts

Major sources of emissions from full development of the Navy Yard include both mobile sources (automobile, trucks, and bus traffic, outboard-powered vessels) and stationary sources within the Shipyard (building heating systems, industrial uses, garage exhaust systems).

Air quality impacts resulting from vehicular traffic generation associated with the proposed project have been evaluated above (see "Traffic-Related Impacts"). Private outboard-powered vessels from the proposed marina will emit carbon monoxide and hydrocarbons as primary pollutants with secondary amounts of sulfur oxides and nitrogen oxides. Under current plans, the marinas will provide space for some 550 boats, of which an estimated 25% will be powered by outboard motors. Based on EPA average emission factors for outboard motors¹ it is estimated that the boats from the marina would produce the following pollutant burden:

¹ U.S. Environmental Protection Agency, Compilation of Air Pollution Emission Factors (AP-42), Second Edition, Research Triangle Park, NC, March 1975, Table 3.2.4-1.

Table IV.C.8: Emission Factors for Heavy-Duty Vehicles and Construction Equipment

(1) Heavy-Duty Construction Equipment (Miscellaneous Category)¹
(1,000 hours/year annual operation)

	<u>Diesel-Powered</u> (lbs./10 ³ gal)	<u>Gasoline-Powered</u> (lbs./10 ³ gal)
CO	94.2	3,960
HC	34.7	130
NO _x	494	95.8
SO _x	31.1	5.28
TSP	30.1	6.06

(2) Heavy-Duty Vehicles²

	<u>Diesel-Powered</u> (g/mi)	<u>Gasoline-Powered</u> (g/mi)
CO	20.4	130
HC	3.4	13
NO _x	34	9.2
SO _x	2.4	.26
TSP	1.2	.65

¹ U.S. Environmental Protection Agency, Compilation of Air Pollution Emission Factors (AP-42), Second Edition, Research Triangle Park, March 1975, Table 3.2.7-1, 3.2.7-2.

² Ibid, Tables 3.1.4-1, 3.1.5-1.

Table IV.C.9: Pollutant Emissions for Charlestown Navy Yard Marina

<u>Pollutant</u>	<u>EPA Emission Factor¹ (g/hphr)</u>	<u>Estimated Emissions (Kg)</u>
CO	250	15,640.50
HC	85	5,317.77
SO ₂	0.49	30.66
NO ₂	0.79	49.42
TSP	negligible	-

¹ Based on national average power produced per outboard of 9.1 hp and average annual usage of 50 hours. Portion of exhaust remains behind in the water; factors are emissions into the atmosphere.

Heating for the project area's buildings is expected to be furnished partly by Boston Edison electricity and partly by individual systems burning residual fuel oil. Residual fuel oil is relatively clean and is not associated with high pollutant emissions. The major pollutants emitted are SO₂ and NO_x. As specific design data relating to the heating systems are not available at this stage of the project, the air quality impacts cannot be accurately defined.

The Massachusetts Department of Air Quality Control does require a permit for all fuel burning equipment rated at 3.0 million BTU/hour or greater, and no permit will be issued unless the Department is satisfied that no adverse air quality impacts will occur. Increased demands on the Edison system could result in additional fuel usage, and hence pollutant emissions, at its generating plants, which, however, would be distributed throughout that system rather than localized at a specific plant.

The proposed industrial uses also can be expected to emit some pollutants, but these cannot be identified at this time since the nature of the industrial firms is not known. No on-site incineration or power generation is proposed within the development area.

Exhaust air from the ventilation systems of the proposed parking structures (Buildings 149 and 199) also will emit pollutants, primarily carbon monoxide, into the atmosphere. Since these systems have not as yet been designed, the amount of pollutants that would be emitted cannot be predicted with any accuracy. However, care will be taken in the location of the garage intake and exhaust fans to prevent accumulation of pollutants in populated portions of the site and to prevent adverse impacts on nearby buildings.

4. Impact of Alternatives

(1) "No-Build"

Very minimal, if any, change in existing air quality would result from a "no-build" alternative. Major traffic generated from lease of the Yard would consist of trucks and employee cars and would be significantly less than that to be generated by the proposed development. Since traffic generated by the proposed project is not expected to violate any air quality standard, the no-build alternative should not cause any problems. There would be no construction-related impacts.

(2) Alternative Development Options

Under the alternative development options, construction-related air quality impacts would not differ appreciably from the proposed development program, although the magnitude of the impacts would be reduced considerably, since less demolition and less new construction were proposed in these options (the industrial/institutional option, for example, contemplated approximately 1/5 as much demolition and 1/10 as much new construction, primarily reusing existing buildings). Thus the amount of particulate matter that would be emitted into the atmosphere would be reduced accordingly. Traffic-related air quality impacts also would be somewhat less, since it is estimated that traffic generated by the alternative development options would be from 56% to 74% of that of the proposed development.

Development-related impacts of the housing/industrial/institutional option would be generally similar to the proposed project, although a higher amount of industrial emissions would result. Under the industrial/institutional package air quality impacts would be expected to be more severe, due to increased industrial use, including heavy industry and possibly some shipyard activities, the construction of a new rail access route, and the retention of the existing power plant to provide power and steam for the industries. Principal emissions from diesel locomotives would be carbon monoxide, hydrocarbons, and nitrogen oxides, and from the oil-fired power

plant particulates, sulfur oxides, and nitrogen oxides. Although the power plant would have to meet State permit requirements, the levels of pollutants produced probably would exceed those generated under the other proposals.

A 200 boat marina was proposed in the housing/industrial/institutional option. In the industrial/institutional option, the marina would be replaced by ship operations with inboard powered diesel vessels in berth, which would produce sulfur oxides, carbon monoxides, and nitrogen oxides as principal pollutants. No on-site solid waste combustion or incineration was proposed under either alternative option.

(3) Shipyard Reuse

Construction-related air quality impacts under this alternative would be minimal, since total reuse of the existing structures was contemplated, with very little demolition or new construction. In the long-term, however, air quality would be substantially impacted from the intensive industrial use of the Yard for ship repair and construction, on-site power generation from the existing power plant, and reestablishment of rail service to the Yard. Although vehicular traffic generated would be considerably less than that of the proposed development, the volumes of truck traffic would be increased, thus affecting local air quality.

In addition to the development-related emissions identified above for the industrial/institutional alternative (power plant, diesel locomotives, vessels in berth), the following table lists the primary and secondary pollutants which would be generated from shipbuilding operations.

Table IV.C.9: Pollutant Emissions from Shipbuilding Operations

<u>Operation</u>	<u>Primary Pollutants</u>	<u>Secondary Pollutants</u>
Metal working shops	TSP	
Solvent storage	HC	
Surface coating	HC	
On-site boilers (non-ship)	TSP, SO _x , NO _x	CO, HC
Fabrication	TSP	SO ₂ , CO, HC, NO _x
Ship test boilers	TSP, SO _x , NO _x	CO, HC
Boilers cleaning and overhaul	TSP	
Sandblasting	TSP	

Source: Wallace, et al, Land Use and Transportation Study, Boston Naval Shipyard, Phase II Report, July 1974, pp. III-45 - III-46.

IV.D. GEOLOGY, TOPOGRAPHY, AND HYDROLOGY

1. Existing Conditions

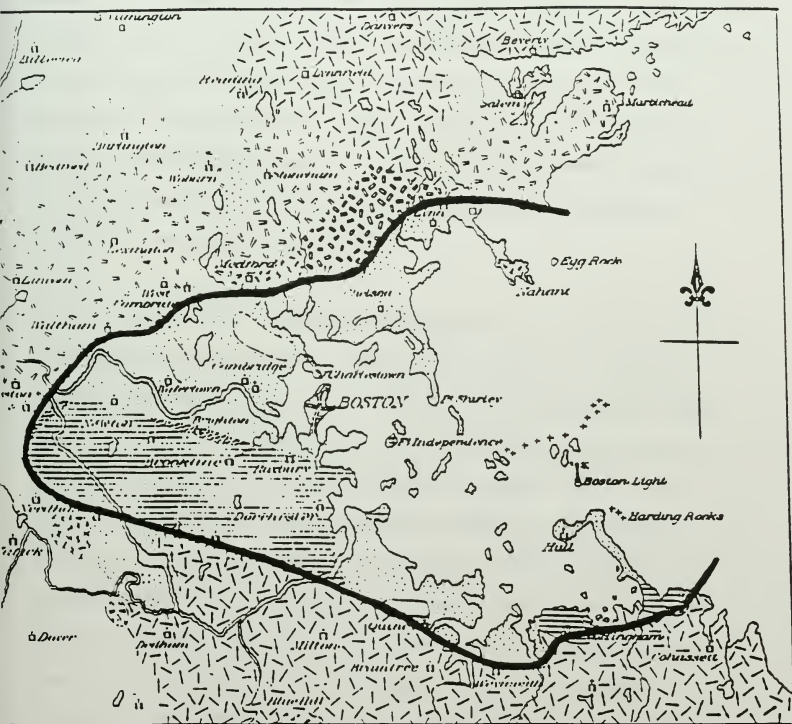
Geology

The Charlestown Navy Yard site lies in the Boston Lowland, which is centrally located in the Boston Basin (Figure IV.D.1). The Boston Basin was formed several million years ago when internal heat and pressure caused the earth's crust to crack and fault forming rises and depressions. The Boston Basin depression continued to sink slowly after initial faulting, and movement was accompanied by severe earthquakes. Although crustal stability has been characteristic of the Boston Basin in more recent geological history, four significant quakes were reported in the colonial period, and the U.S. Geologic Survey has placed Boston in a zone of high seismic risk. The larger portion of the Boston Lowland is less than 50 feet above sea level.

Bedrock of the Boston Lowland consists primarily of Cambridge argillite in the northern portion and Roxbury conglomerate in the southern sector. The bedrock underlying the Charlestown project site is characteristic of the Cambridge argillite formation, which is typically a hard, blue-gray, finely laminated rock resembling a slate. Occasional layers of tuff and sandstone also are typical of this formation, as well as numerous diabastic sills and dikes. The entire system is steeply inclined with individual layers ranging in thickness from a few inches to a few feet.

The general pattern of deposition of sediments in the project area from the bedrock to the soil surface is glacial till, marine deposits,

BOSTON BASIN












Similitude Greenstone Pelitic Porphyry Greywacke Amygdaloid Argillite Alluvion

EARLIEST GEOLOGIC MAP OF THE BOSTON DISTRICT

After Dana, J. F. and S. L. Outline of the mineralogy and geology of Boston and its vicinity, with a geological map. Boston, Cummings & Hilliard, 1818.
 Also in Am. Acad. Arts and Sci. Mem., vol. 4, 1818.

Figure IV.D.1: Geologic Map of the Boston Basin

organic silt, and recent fill. Five soil profiles which illustrate changes in the sub-surface soil conditions from the Harbor to the inland boundary of the Shipyard have been compiled from a composite of 246 test borings provided by the U.S. Navy.¹ Although the boring locations tend to be clustered in certain areas of the site rather than be evenly distributed, and descriptions of many of the boring logs are general, the soil classifications and data in the profiles do provide a good basic description of existing sub-surface conditions (see Appendix E.1 for profiles and boring locations).

The first layer of soil overlying the bedrock was laid down during the Pleistocene Age when the final advance of the continental ice sheet occurred over the Boston area. The advancing ice scoured the surface, removing material as it went along. During the retreating stage, the melting ice deposited a prodigious amount of glacial till - a very dense, non-stratified, unsorted material ranging in size from fine clay to boulders. The composition of the glacial till in the Boston area varies somewhat, but it is commonly extremely compact and composed of varying amounts of silt, sand, and gravel. In some areas, particularly near the waterfront, a "till-like" material of clayey composition is frequently encountered overlying the glacial till. This "till-like" material is found in the project area. However, boring data are in-

¹ Haley and Aldrich, Inc. Report on Preliminary Investigation of Existing Soil and Foundation Conditions, Boston Naval Shipyard, Boston, Massachusetts, Cambridge, MA, February, 1976.

sufficient to define the extent and limits of the material or to positively distinguish the two layers. Therefore, the till and "till-like" layers are considered as a single stratum of glacial till in the soil profiles. This layer is at least 100 feet in thickness in some areas, although a more precise determination of thickness could not be made since bedrock was not reached in the borings. Glacial till was encountered at depths from 120 feet inland to -20 feet near the end of pier 10 and is medium to very compact.¹

The retreat and melting of the ice sheet brought an attendant rise in sea level, inundating the project area with marine waters. Quantities of silt and clay-size particles discharged by meltwater streams into the sea slowly settled out of suspension to form a deposit of clay which blankets most of the Shipyard. This clay is generally a very soft to stiff gray silty clay containing trace amounts of sand and gravel. The surface of the clay frequently has weathered to a yellow color, stiffer in consistency than the underlying layer. This stratum was encountered from -120 feet to +110 feet and ranges from 0 to 32 feet in thickness. Some of the borings encountered a layer of sand or sand and gravel overlying the clay. This material is also of marine origin and was deposited discontinuously across the site.

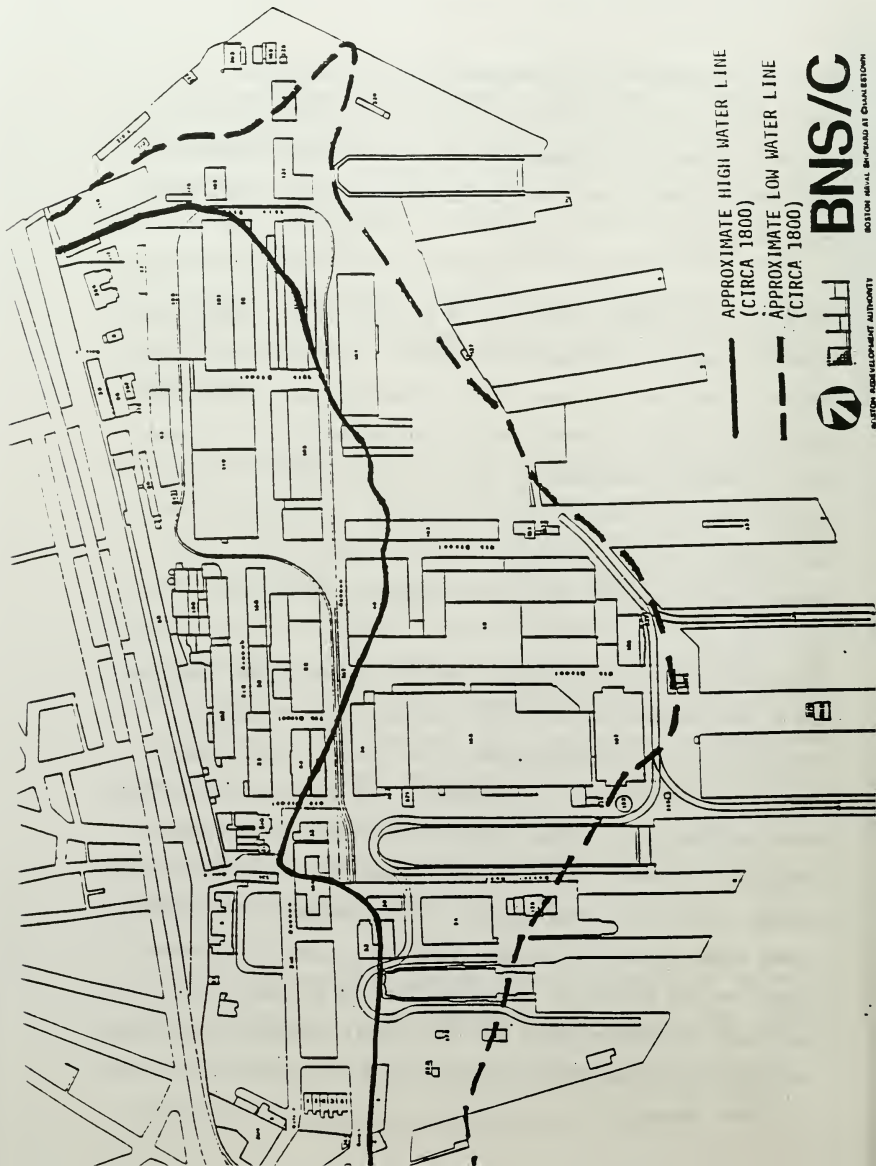
With the final emergence of the area after the subsiding of the sea, a tidal embayment developed in the vicinity of the project site. Organic

¹ Elevations are Boston Navy Yard Datum (see "Topography" below).

materials were deposited in the embayment over the marine clay. The organic deposits consist of very soft to soft gray organic silts and peats which contain varying amounts of sand. The organic stratum was encountered at depths from 60 feet to 120 feet and ranges in thickness from 0 to 36 feet.

In recent years, seaward portions of the project site have been filled by man. Figure IV.D.2 indicates the boundary line between the original land and filled land. The area of fill corresponds approximately with the location of the high water line of 1800 and the existing bulkheads. The fill material encountered at the site is from 5 feet to 45 feet in thickness and is of loose to medium compactness. It is composed of sand, gravel, clay, silt, cinders, brick, and ashes. A very thin surface layer of the fill also extends over the original land.

The nature of the sub-surface soil conditions in the project area also can be inferred from information on existing building foundations. Proceeding from the northwest corner of the site in a northeasterly direction toward the Little Mystic Channel, the foundation types of the major buildings generally vary from spread footings to deep spread footings to footings with piers to pile foundations, or from relatively shallow foundations to deep supports. The foundations become progressively deeper as the fill and underlying soft organic layers become deeper and less supportive. Proceeding from the northwest corner in a southeasterly direction toward the Main Channel foundation types change abruptly from shallow spread to footings to pile foundations, or to the



APPROXIMATE HIGH WATER LINE
(CIRCA 1800)

APPROXIMATE LOW WATER LINE
(CIRCA 1800)



BNS/C

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
BOSTON AREA OFFICE

deep footings with piers. The progressively deeper foundations reflect the increasing compressibility of the soils approaching the Harbor. It is possible that the deeper foundations of Buildings 33, 34, 38, 39, and 200 reflect either the conservatism of the designer or the presence of a soft organic silt layer extending that distance from the Harbor, as suggested by the soil profile for that section of the Shipyard.

Topography

The Charlestown Navy Yard project site is relatively flat, with minimum slopes dipping generally from the northwest (Chelsea Street) downward towards the dock area. Ground surface elevations vary from a high of 122 feet near Gate 5 to lows of 114 to 115 feet at the water's edge. (Elevation datum is Boston Navy Yard Datum: Mean Low Water = El. 100.00. Mean Low Water in the Boston Harbor is 4.84 feet below U.S.C. & G.S. Mean Sea Level Datum of 1929).

Hydrology

Groundwater data in the Shipyard are based on 36 observations, most of which were made at the completion of borings, and thus it is unlikely the levels were stabilized at the time of reading. Groundwater levels ranged from 81.2 feet to 113.0 feet and averaged 107.4 feet. Readings were generally higher west of First Avenue, where the soils are more compact. Comparison with surface elevations indicates that groundwater levels vary from 4.0 to 11.8 feet below ground surface, and average 8.1 feet. Since no long term observations were recorded, the extent of groundwater fluctuation is not known. However, it seems probable that

levels fluctuate due to tidal influences, particularly in the seaward portions of the site where there is relatively loosely consolidated filled land. The more porous and permeable soils permit rapid movement and adjustment of water levels. The water table is not directly influenced by precipitation in the project area since the Shipyard is almost totally paved throughout. When precipitation does occur, it discharges directly into the Harbor as runoff or indirectly through the existing storm drainage system.

A large portion of the project site, including the piers and drydocks and the land area extending approximately to First Avenue, lies within the Flood Hazard District as defined by the City of Boston Zoning Commission (see Figure IV.D.3). (It is anticipated that the same area also will be adopted as a Special Flood Hazard Area by the Flood Insurance Administration of the U.S. Department of Housing and Urban Development.) The U.S. Army Corps of Engineers estimates the 100-year flood elevation for Boston Harbor and vicinity at 10.8 feet Mean Sea Level (115.64 feet, Navy Yard Datum) (see Appendix E.2). Since the lowest elevation at the project site is 114 feet, NYD, flooding on the site would not exceed 1.64 feet during a flood equivalent to the 100-year flood level.

2. Impact of the Project

Since the project site, during the past one and three-quarters centuries, has been intensely developed with industrial and other buildings, many of which are massive and several stories (maximum ten) in height, and contained heavy machinery, no adverse impacts on the existing land

conditions are anticipated from the proposed development. With the exception of foundation requirements imposed by the soil conditions at the site, the topography and geologic conditions should not present any problems to future building. The tallest of the proposed residential buildings will be mid-rise and will not exceed the height of the existing largest multi-storied buildings (Nos. 149 and 199); therefore, no significant stress is expected to be placed on the ground structure. The existing topography is not expected to be greatly altered, although some man-made slope areas are proposed in the waterfront park to enhance the water views and to provide visual diversity within the park.

Foundation types needed within the project area will vary depending on the specific location at the site and the size and construction of a proposed building. Normal spread footing foundations may be suitable for support of reconstruction in some portions of the original land area whereas deep foundations such as piles or caissons may be required for most structures within the filled area. Reuse of some existing foundations may be technically and economically feasible particularly if data are available concerning the design and location of the foundations. Additional sub-surface explorations and more detailed foundation design studies will be required for new construction at the site.

Foundations for new structures should be designed to bear below the miscellaneous fill and organic soils. This requirement will dictate the need for deeper foundation units closer to the water edge and shallower units to the north and west.

For low to medium rise structures it may be feasible to bear on the surface of the clay stratum immediately underlying the fill and organic soils. This could be accomplished with belled caissons and would require evaluation of the long term settlements associated with consolidation of the clay stratum. For higher structures or concentrated foundation loads, it may be necessary to bear on the glacial till underlying the clay stratum. Belled caissons appear to be feasible in this situation as well as end bearing piles.

Current plans for new housing construction in the area west of Piers 7-10 specify the use of existing foundations whenever possible, supplemented by caissons in presently undeveloped areas. Deep piling is expected to be required in the housing area between Pier 10 and the Little Mystic Channel, due to the soil characteristics at this location.

Rehabilitation and reuse of existing buildings in the Yard may produce an increase in actual loads to be supported by the existing foundations. In order to estimate possible settlements resulting from the new loads, more specific data are needed on the compressibility characteristics of the foundation soil and on previous maximum actual loads.

With the increase in landscaped areas as a result of the proposed development, some minimal increase in groundwater levels may be anticipated, particularly following periods of precipitation. However, since no basements or other below-surface structures are contemplated in the programmed development, existing and future groundwater levels will

not affect proposed construction. The developer of the new housing along the waterfront and on the piers is cognizant of the Flood Hazard District, and the location of residential units in this area will comply with all applicable regulations concerning buildings within a flood hazard zone. Since the lowest elevations within the Shipyard are only 1.64 feet below the 100-year flood level, any structure within the Flood Hazard District should suffer only minimal, if any, damage during normal flood conditions. If buildings are not properly constructed, however, serious property loss could occur at flood time, and the resultant debris could present a hazard to the Harbor.

3. Impact of Alternatives

(1) "No-Build"

Since this alternative would utilize existing structures and would not involve any new construction, no impact on topographic and geologic conditions would be anticipated.

(2) Alternative Development Options

Impacts on land conditions would be essentially the same as the proposed project, since the alternative development proposals likewise would involve reuse of existing structures and the construction of new buildings. Existing soil conditions would dictate the types of foundations required at particular areas of the site, and new buildings would not be taller than those presently found in the Yard. There would be minimal or no alteration of the existing

topography. Impacts on groundwater levels would not be expected to differ appreciably from the proposed development.

(3) Shipyard Reuse

Revitalization of a shipyard industry at the Navy Yard would not be expected to have any significant impact on land conditions or groundwater levels since the existing buildings and facilities would be reused for the same purposes for which they were originally designed.

IV.E. WATER QUALITY

1. Existing Conditions

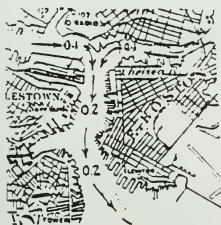
The Boston Inner Harbor extends for about four miles from the Castle Island-Governor's Island line to the confluence of the Mystic and Chelsea Rivers. Circulation in the main channel is dominated by tides with an average height range of 9.5 feet. The Inner Harbor also receives the flow of the Charles, Mystic, and Chelsea Rivers and from sewer outfalls surrounding the Harbor. Currents generally range from 0.1 knot to 0.7 knot and vary with the tides, the ebb tide being stronger due to the effect of the outflow of the rivers (see Table IV.E.1 and Figure IV.E.1).

The Little Mystic Channel has a total water surface area of 97,000 square meters and receives its flow from the tidal variation of the Harbor and from sewer outfalls. The water in the Channel, therefore, is essentially the same as that of the Inner Harbor. However, dispersion of pollutants is somewhat more inhibited in the Channel due to its protected configuration.

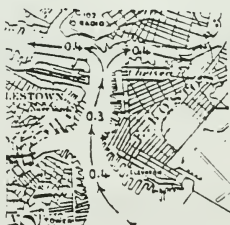
Existing Water Quality

The Massachusetts Division of Water Pollution Control has classified the water of Boston Inner Harbor, including the Little Mystic Channel, as "S.C." An "S.C." designation indicates that the water should be "suitable for aesthetic enjoyment, for recreational boating, and as a habitat for wildlife and common food and games fishes indigenous to the region" (see Appendix F.1). This classification is an established goal for the Inner

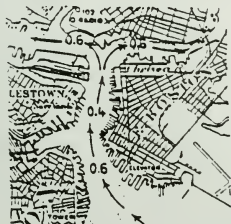
TIDAL CURRENTS



(a) $\frac{1}{2}$ hour after low water



(b) $2\frac{1}{2}$ hours after low water



(c) $4\frac{1}{2}$ hours after low water



(d) High water



(e) 2 hours after high water



(f) 4 hours after high water

Figure 17.E.1: Tidal Currents in Boston Inner Harbor

Velocity given in knots. Tidal cycle measured relative to Boston Light Station

Source: U. S. Coast and Geodetic Survey, Tidal Current Charts, Boston Harbor, Serial No. 504, 1953.

Table IV.E.1

Spring Velocities and Direction of Current¹

	<u>Speed in Knots</u>	<u>Direction</u>
1/2 hour after low water	0.2	ebb
1-1/2 hours after low water	0.1	flood
2-1/2 hours after low water	0.3	flood
3-1/2 hours after low water	0.4	flood
4-1/2 hours after low water	0.4	flood
5-1/2 hours after low water	0.3	flood
High water	0.1	flood
1 hour after high water	0.2	ebb
2 hours after high water	0.4	ebb
3 hours after high water	0.6	ebb
4 hours after high water	0.7	ebb
5 hours after high water	0.6	ebb

NOTE: All times are in relation to the tide at Deer Island Light.

¹U.S. Coast and Geodetic Survey, 1973.

Harbor; and according to the Division of Water Pollution Control, water samplings taken from the Inner Harbor in 1972 have generally met the numerical criteria established for "S.C." water. However, this does not imply that the water in the Inner Harbor necessarily provides an optimal environment for aquatic life or that improvement of water quality conditions is not an important objective. Although numerical standards for "S.C." water have not been defined for parameters such as chemical constituents and coliform bacteria, these pollutants have a significant adverse impact on water quality. While floating solids and debris do not degrade water quality per se, they are an adverse influence on the aesthetic quality of the water body. The polluted bottom sediments have an adverse effect on water quality particularly when they are stirred into the water column.

At the time of the initial classification in 1967, biological investigations in the Harbor revealed bottom deposits of black, oozy muds that emitted foul odors and contained oil residues at all locations. In 1972, the Massachusetts Division of Water Pollution Control undertook a study of water samplings throughout Boston Harbor. Table IV.E.2 summarizes the composite water quality of the Inner Harbor from this survey. Criteria for evaluating water quality are given in Appendix F.2. Four water sampling stations (118, 119, 120, and 121) were located at the Little Mystic Channel and Charlestown Shipyard (see Appendix F.3). The range of values for selected parameters measured at each of the stations is indicated in Table IV.E.3.

Table IV.E.2

COMPOSITE WATER QUALITY
BOSTON INNER HARBOR JUNE-NOVEMBER 1972¹
AND NORTH RIVER ESTUARY 1970²

	INNER HARBOR <u>RANGE</u>	INNER HARBOR ARITHMETIC MEAN <u>(10 SAMPLES)</u>	NORTH RIVER ESTUARY ARITHMETIC MEAN <u>(8 SAMPLES)</u>
Surface Temperature (°C)	5-18*	15	16
Bottom Temperature (°C)	3-14*	-	-
Dissolved Oxygen (mg/L)	2.1-5.7	4.0	3.3
Biological Oxygen Demand (mg/L)	1.1-6.8	2.9	1.7
pH	7.2-8.1	7.5	-
Total Coliform (MPN/100 ml)	930-4.6x10 ⁶	484,000	36
Fecal Coliform (MPN/100 ml)	91-1.5x10 ⁶	149,000	<36
Suspended Solids (mg/L)	15-29	<20	3.4
Color (SU)	15-30	22	16
Turbidity (JTU)	0-8	2.1	0
Total Alkalinity (mg/L)	45-149	108	101
Chlorides (mg/L)	6,400-18,000	14,000	11,900
Salinity (g/L)	11.7-33.1	25.8	21.9
Total Phosphorus (mg/L)	0.1-0.24	0.15	.09
Total Kjeldahl Nitrogen (mg/L)	0.6-1.8	1.2	-
Ammonia-Nitrogen (mg/L)	0.03-0.56	0.27	.45
Nitrate Nitrogen (mg/L)	0-0.1	0.07	-

* Yearly range.

¹Massachusetts Division of Water Pollution Control, 1972

²Massachusetts Division of Water Pollution Control, 1971

Table IV.E.3

Water Quality Samples-Little Mystic Channel and Boston Inner Harbor, Charlestown 5/72-8/72

	Starr King Court Station #118	Chelsea Street Station #119	Vine Street Station #120	Wapping Street Station #121	Class S C Standards
O.O. (mg/l)	5.4-12.2	3.3-11.6	4.2-5.5	2.3-4.9	3-5 minimum*
BOD	2.4-6.8	1.8-5	2.1-7.45	2.6-4.5	**
pH	7.5-8	6.9-8.1	7.7-7.9	6.6-7.4	6.5-8.5 optimum
Total Suspended Solids (mg/l)	0-11	0-8	0-140	0-271	100 maximum
Coliform/100 l - Total	24,000-460,000	36-46,000	43,000-9.3 x10 ⁶	460,000-24x10 ⁶	**
Fecal	91-93,000	36- 9,300	2,300-430,000	23,000-930,000	
Total Phosphorus (ng/l)	.12-.22	.12-.18	.16-.93	.16-.24	.05 maximum
Total Kjeldahl Nitrogen	1.1	.8-1.4	.8-3.5	.8-2.1	.3 maximum

* Not less than 5mg/l during at least 16 hours of any 24 hour period, nor less than 3 mg/l at any time.

** No quantitative standards have been established for "SC" water.

Source: Massachusetts Water Resources Commission, Division of Water Pollution Control, "A Pollution Survey of Boston Harbor," April, 1973.

The dissolved oxygen content (DO), which is an essential element for support of healthy aquatic life, was relatively low during certain individual samplings. As in most natural water bodies, the tolerance for oxygen depletion is low and DO should average 5 mg/l. DO is diminished by a combination of chemical and biochemical oxidation (COD and BOD) of organic wastes, and by the metabolism of aquatic life. In general, BOD and COD levels in the Inner Harbor do not present an extreme danger to aquatic life, since the DO levels measured were usually greater than the oxygen demand. However, the available DO at any given time is easily affected by uncontrollable variables such as tides, rainfall, and daylight vs. night hours, and therefore control of man-induced sources of pollution that would increase the BOD and COD is important.

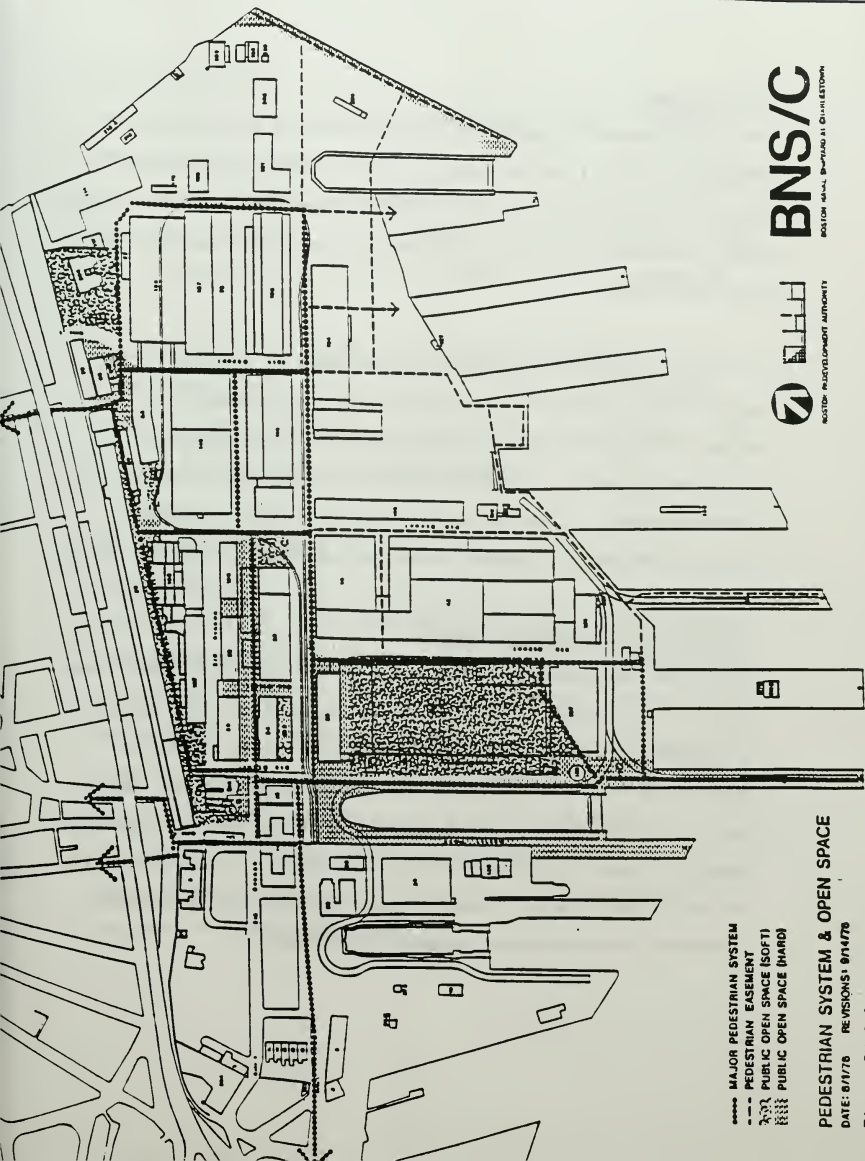
The total phosphorus and total Kjeldahl Nitrogen levels measured at the four stations far exceeded the standards set for these parameters. Both elements are crucial nutrients for plant and algal growth; however, high concentration can generate aesthetically displeasing algal blooms and increase oxygen demands.

Total suspended solids and turbidity measurements are closely related parameters. Turbidity is a measure of water clarity. Water loses clarity as the absorption of light by suspended particles activated by turbulence increases. In samples taken at the project site, suspended solids range from very low to very high levels (in excess of the 100 mg/l maximum allowable levels). One of the most significant effects

of the high levels of suspended solids is the impairment of respiration of aquatic animals. In addition, a high level of turbidity can reduce the oxygen concentration in natural waters and can inhibit photosynthesis through a reduction in light penetration. The most serious effect of extensive sedimentation of suspended solids is the blanketing of the bottom with a layer of sterile inorganic sediments which can inhibit the respiration and filtration processes of benthic life and reduce food supply for fish.

One of the most significant parameters measured for water quality in the Inner Harbor is coliforms. Coliforms are bacteria used as indicators of fecal pollution. In the samples taken at the four stations, both total coliforms and fecal coliforms were excessively high, frequently reaching the 10^6 order of magnitude. At this time, there is no quantitative standard for coliforms in the Harbor because of sewage and runoff problems. However, by comparison, in "SC" water not subject to these sources of pollution the maximum allowable level is 5,000 coliform bacteria per 100 ml. The limit of total coliform for swimming is 1000 per 100 ml. and 200 per 100 ml. for fecal coliforms. Shell fishing is prohibited where total coliforms exceed 700 per 100 ml.

A comparison of average trace metal concentrations found in the Inner Harbor to those of the Outer Harbor and to the oceanic average shows concentrations in the Inner Harbor to be in excess of those of the Outer Harbor, and over ten times as great as the oceanic average for certain



BNS/C
BOSTON PLANNING BUREAU & CONSULTANTS



MAJOR PEDESTRIAN SYSTEM
PEDESTRIAN EASEMENT
PUBLIC OPEN SPACE (SOFT)
PUBLIC OPEN SPACE (HARD)

PEDESTRIAN SYSTEM & OPEN SPACE

DATE: 8/1/78 REVISIONS: 01/14/79

Figure IV.6.3

Public Marinas

Pier 6 will accommodate approximately 100 slips to be rented to the general public with a limited number of slips reserved for residents. Access to floating docks will be by catwalks constructed from the existing piers. Additional piles will be required for boat mooring and securing the floating docks.

New marina facilities for approximately 200 boats are proposed in the area of Piers 8, 9 and 10. The existing piers must be demolished because of their poor condition and new piers will be constructed in their general location. Floating docks will extend from the piers, with access by catwalk. As in the case of the Pier 6 marina, additional piles will be required for boat mooring and securing the floating docks.

Residential Recreational Facilities

Each of the 200 townhouse units proposed for development on Piers 5 and 7 and along the water's edge will have its own boat mooring facility. In addition, the total housing development will contain extensive recreational facilities including landscaped open space areas, tennis courts, swimming pools, and deck tennis. It is estimated that approximately 4-6 acres of self-contained open space will be included as part of the residential area. Specific design features will be developed along with the architectural planning of the complex.

Pedestrian Circulation

Visitors arriving at the park will circulate on walkways of varying sizes depending upon their function and degree of use. The Promenade around the Dry Dock will be the widest and the most prominent path. It will extend from the arrival plaza near Building 36 to Pier 4 and will allow circulation for large groups of people going to the marina.

Four major paved paths in the landscaped area will converge at the Fountain Plaza. Park visitors can use the paths to move from the Promenade to other open spaces in the Shipyard. Smaller gravel paths will wind in and around the botanical garden.

(2) New Development Area

Public Open Space

Design controls for the New Development Area require public easements from First Avenue to the waterfront along 9th, 13th and 16th Streets. In addition, the controls require public easements along the water's edge with special consideration given to (a) Pier 6, to be developed as a public marina with provision for public access to the end of the pier, (b) a plaza adjacent to Pier 6 and the Building 42 residential complex, (c) the area around the shipways, to allow the public to enjoy views of the water and the activities of the marinas, and (d) Pier 11, to be developed as a public promenade.

(3) Historic Monument Area

Sidewalks and open areas in the Historic Monument Area will be treated in such a way as to be more conducive to pedestrian activity but will be consistent with the historical and environmental character of the Shipyard. Physical and documentary evidence of earlier landscaping features will be used as the basis for the choice of surface materials, type and location of trees or other plant materials, and street furniture. The historic "flirtation walk" adjacent to the Ropewalk, Second Avenue between Sixth and Ninth Streets, and a public plaza between Buildings 39 and 105 will be the major elements of the open space network in the Historic Monument Area.

3. Impact of Proposed Open Space and Recreational Facilities

The proposed park and open space facilities within the Shipyard will serve three distinct populations. The largest of these are the visitors attracted to Charlestown by its many historic sites, the foremost being the USS Constitution, the largest single tourist attraction in Massachusetts. Located adjacent to the proposed waterfront park site, the Constitution and National Park are expected to attract over one million visitors a year. The second largest group are the residents of Charlestown, who, as noted previously, are especially deficient of waterfront park space. The third group will be the approximately 4,500 residents of the proposed new housing to be developed in the eastern section of the Shipyard. The planned facilities, therefore, have been designed to fulfill the recreational needs of these three groups of users.

Open space specifically programmed for public use in this plan will increase the amount available in Charlestown by over 20 acres. Several more acres of landscaped pedestrian easements, streets, and sidewalks will be accessible to the public in the Historic Monument Area and the New Development Area. In particular, access to and utilization of the waterfront will be greatly increased by the development of the public park, marinas, and the pedestrian easements throughout the New Development Area, thus opening up a significant portion of the Charlestown waterfront to the residents of Charlestown and the public in general.

By its location adjacent to the National Historic Park, the proposed public park will be ideally situated to serve the thousands of park visitors as well as enhance the environmental setting of the USS Constitution. The preservation of Dry Dock No. 2 and other historic elements on the park site, in particular, will serve both visually and physically to expand the historic character of the adjacent National Park. Except temporarily during the construction phase, when air pollution and noise levels can be expected to increase and thus impact visitors to the USS Constitution, the public park is not expected to have any adverse impacts on the National Park. In addition, its waterfront location will also enhance the harbor area, open vistas to and from the Shipyard, and facilitate pedestrian access to the water's edge. The park will help to open up the Shipyard site, which presently is intensely developed, and will provide a significant amount of landscaped space in an area which is predominantly hard-surfaced.

Implementation of the park proposal will result in an adverse impact on the historic character of the Shipyard, since it will require the demolition of Building 195, a structure which (along with the entire Yard) is listed on the National Register of Historic Places.¹ However, removal of this structure is consistent with the reuse objectives for the Shipyard, and the adverse effect will be mitigated through execution of a Memorandum of Agreement with the National Advisory Council on Historic Preservation (see Appendix J.4). The proposed park on this site will both restore the open space that formerly existed here and served the recreational needs of the Shipyard and the Charlestown community for some 40 years after the turn of the century and restore the historic relationship of adjacent Buildings 36 and 42 with the water. The park design also incorporates the Pump House and the historic groundplane elements such as the crane tracks, bollards, and capstans which will be preserved and rehabilitated as recommended by the National Park Service "Basic Guidelines for the Rehabilitation of Historic Property."

The construction of the public marinas will help to fulfill a growing need in the Boston area for berthing space for recreational boats. At the same time, however, the addition of some 400-500 boats in the confines of the narrow industrial ship channel could produce problems of boating safety and control. The incorporation of a harbor master's

¹ This determination has also been made by the Bureau of Outdoor Recreation, in consultation with the Massachusetts Historic Preservation Officer, pursuant to a Federal historic preservation (Section 106) review.

control station into the marina complex could help to minimize such problems. Within the New Development Area, the private berthing slips and the programmed open space and recreational facilities, along with the public park, will provide for much of the recreational needs of the new residents.

3. Impact of Alternatives

(1) "No-Build"

Under this alternative, there would be no provision for any public open space or recreation facilities and no public access to the waterfront. Thus, the park and open space needs of the Charlestown community and the visitors to the National Park would be unmet.

(2) Alternative Development Options

Under the housing/industrial/institutional alternative, the public open space system would include extensive pedestrian circulation throughout the institutional, hotel, and housing areas, continuous landscaped pedestrian access from the National Park to a marina, and a large plaza formed by the demolition of the power plant. Dry Dock No. 2 would be flooded to bring water deep into the site and to facilitate the connection with the National Park. Total public open space, including the piers, would be approximately 14 acres, somewhat less than the proposed development program, but would be similarly open to the residents of Charlestown, tourists, and residents of the site. Some private recreational facilities also would be provided for the new housing units.

In the industrial/institutional alternative, public open space would be limited to the existing streets and to those areas created by the removal of less historically significant buildings and of later additions to the historic buildings, within the Historic Monument Area. There would be no waterfront open space or public access, since the entire waterfront would be given over to industrial uses. No major open space or recreational facilities would be available to the Charlestown community or the National Park visitors.

(3) Shipyard Reuse

With this option, the entire Shipyard would be converted to a private industrial facility, and there would be no development of open space or recreational facilities for public use. As in the no-build alternative, the park and recreational space needs of the residents of Charlestown and the Park visitors, and the desirability of public access to the waterfront, would be unfulfilled.

IV.H. PUBLIC UTILITIES AND SERVICES

1. Description of Existing Facilities

General

The utility systems at the Charlestown Navy Yard are concentrated about a main utility tunnel under First Avenue. As the yard expanded, the utilities were expanded accordingly. Large portions of the distribution systems were added in above-ground segments. While aesthetically unpleasant, this appears to have been a practical approach, as these sections of the system are generally better inspected and maintained.

Sanitary Sewer System

The sanitary sewer system is a separate, single tank collection system discharging into an adjacent M.D.C. (Metropolitan District Commission) interceptor sewer at Water Street.

The average age of the shipyard system is approximately 60 years; piping materials are primarily cast-iron and vitrified clay, although brick and steel can be found. Sewage from waterfront facilities and from other areas of the Shipyard which cannot naturally obtain gravity flow to the M.D.C. system is lifted by means of sewage ejectors to the nearest lateral having that capability. Figure IV.H.1 is a schematic diagram of the system.

A capacity analysis based on an eight hour shift was made in 1974 for the existing sanitary sewer system, excluding service connections into

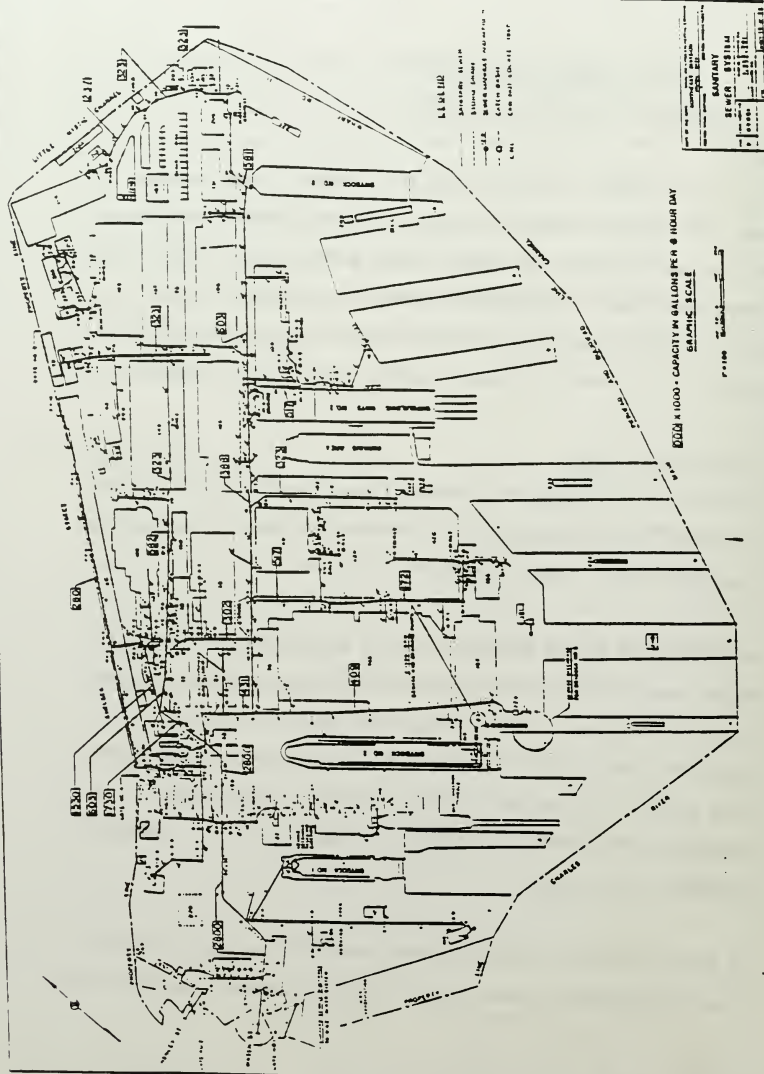


Figure IV.H.1: Sanitary Sewer System - Charleston Navy Yard

the buildings. This analysis was based on invert data obtained from subsurface plans and on the assumption that pipes are capable of flowing full. Selected capacity figures are indicated on Figure IV.H.1 by the symbol 0001.

Considering its age, the sanitary sewer system at the Charlestown Navy Yard is in adequate condition. Manholes are constructed of brick and appear from inspection to be structurally sound. The existing piping also appears to be in fair condition throughout the system.

The MDC interceptor sewer (Charlestown Trunk Sewer) originates at Chelsea and Medford Streets and substantially loops around Charlestown, along the harbor front and the Charles River and up Rutherford Avenue to the North Metropolitan Trunk Sewer and thence to the Deer Island Sewage Treatment Plant, where primary treatment of the sewage is provided followed by chlorination prior to its discharge into the Boston Harbor (Figure IV.H.2). Two outfall pipes extend to the vicinity of Deer Island Light in the President Roads Channel at a depth of 50 feet MSL, and two relief discharge outlets are provided near the shore. The Deer Island plant has a design capacity of 343 MGD average flow and a maximum flow capacity of 925 MGD. In 1975, the plant handled an average flow of 299 MGD, and the projected demand in the year 2000 is 380 MGD. At present, the Deer Island Treatment Plant removes only 34 percent of the pollutants in the waste water (measured as biochemical oxygen demand (BOD)). Under a long-range water clean-up program for the Boston

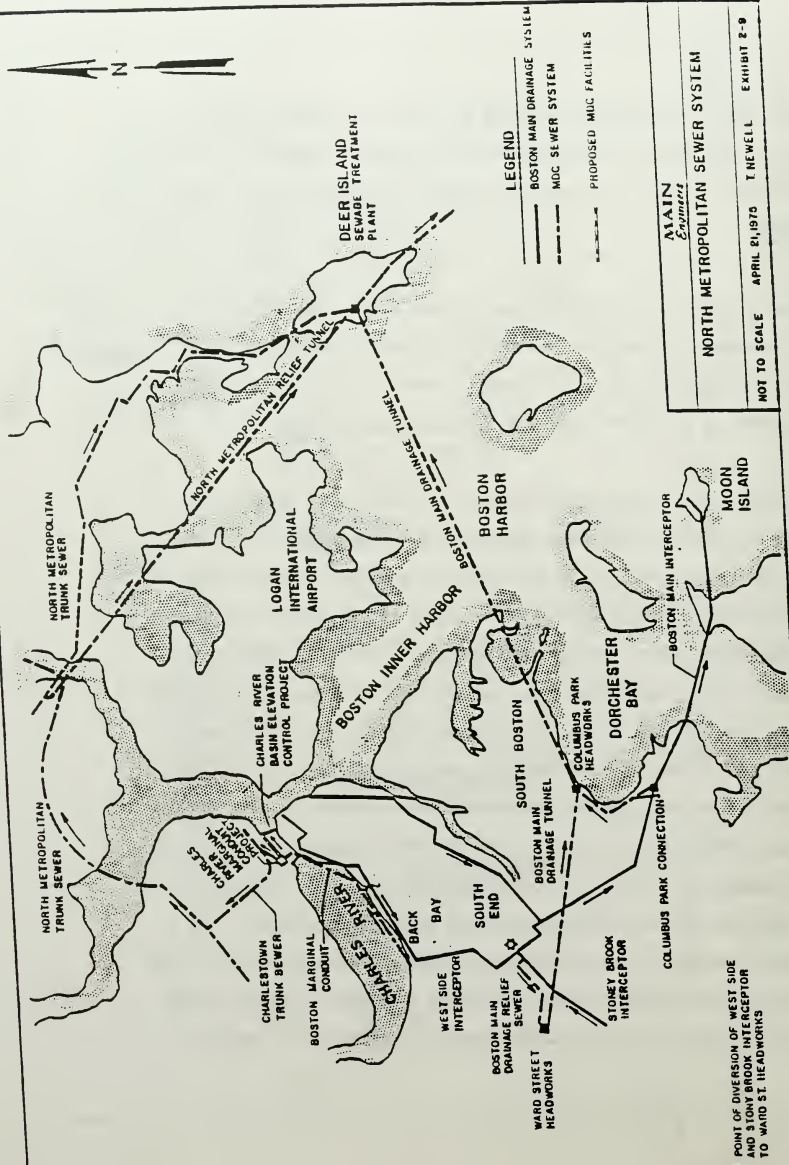


Figure IV.H.2: North Metropolitan Sewer System (MDC)

Chas. T. MaIn, Inc., Environmental Impact Report of Public Utilities in the
Source: Deposed Park Plaza Development, Boston, June 1975

Harbor, the Deer Island plant is expected to be upgraded and expanded to provide secondary treatment, which removes 85-90 percent of the pollutants, by 1985.

Storm Drainage System

The storm drainage system at Charlestown is not a single collection system but a number of systems, all of which discharge into the Harbor at the waterfront at some 30 locations. Pipes are vitrified clay or concrete ranging in size from 6 to 30 inches with the exception of three major drainage conduits. One, a 14-foot, 6-inch culvert, dewateres drydocks 1 and 2 and discharges under pier 4. At the discharge end of this culvert is a "flap gate" to prevent salt water intrusion. The second is a 60-inch combined sewer which originates in Chelsea and Charlestown, enters the Navy Yard opposite Vine Street, and extends under Sixth Street to the Inner Harbor. Within the Shipyard, only storm water runoff enters this line. The third, a 60-inch gravity flow, salt water discharge (part of the salt water coolant system) from the power plant, accepts surface drainage and discharges through the bulkhead to the Little Mystic Channel. The 60-inch pipe connects to a 9' X 5' chamber, which in turn converts to three 36-inch pipes with "Hub Gate" valves at the discharge to prevent salt water intrusion. Figure IV.H.3 is a schematic diagram of the system.

There are also five locations in the Yard where storm water runoff has been connected to the sanitary sewer system. This situation exists because the elevation of the drainage system at these locations is lower than the surface water outfall.

Inspection of the storm drainage system indicates that the system is adequate and in good condition. Since the existing outlets (except as noted above) have no tide gates, salt water intrusion does occur at high tide. During major storms, some flooding does occur at certain locations for short durations, but according to Public Works personnel such flooding has been of minor magnitude and has not resulted in any appreciable damage.

A capacity analysis of the existing storm sewer system was made and the results are shown on the diagram in Figure IV.H.3.

Fresh Water System

Fresh water supply is furnished by the Metropolitan District Water Commission at four locations, all of which are metered: one 12-inch and two 10-inch connections into the 24-inch watermain on Chelsea Street and one 16-inch connection on Water Street at Gate 1. The average age of the water distribution system is approximately 60 years. Seventy percent of the piping is cast iron with bell and spigot poured joints. The fresh waterlines on the piers are steel with Dresser couplings.

Four fresh water booster stations are located at various points within the Yard. Three water storage tanks are located on the roofs of buildings 197, 149 and 199, with capacities of 40,000, 32,000 and 35,000 gallons respectively; these serve to feed the sprinkler systems within each building. In addition, there are reservoirs, not connected to the

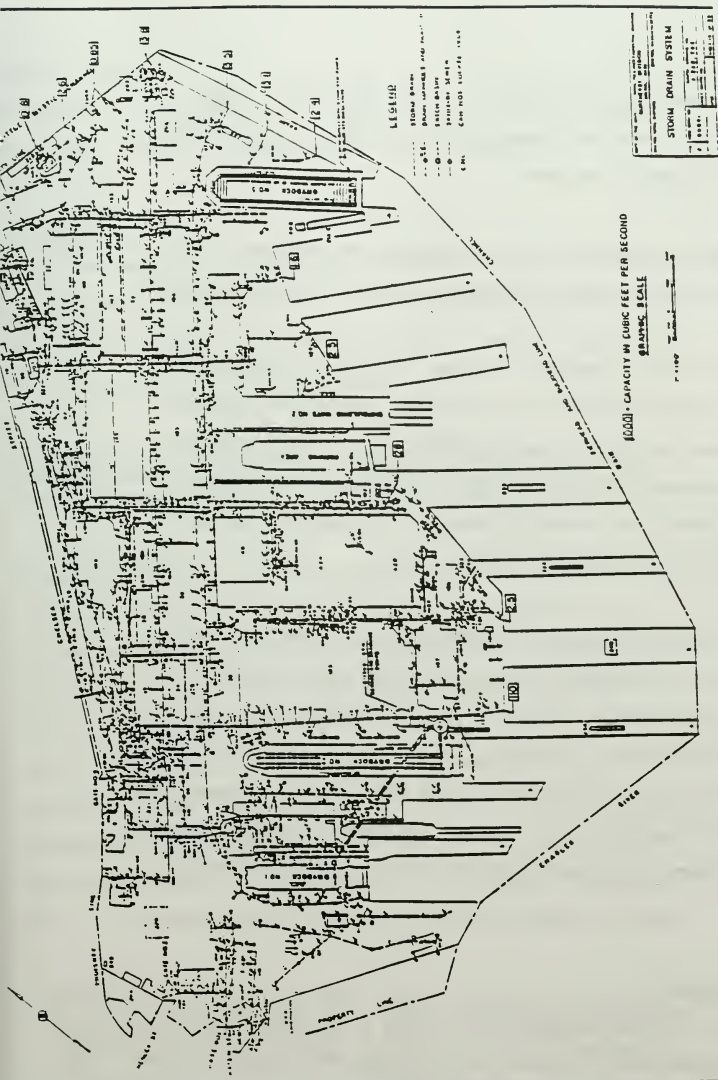


Figure IV.H.3: Storm Drainage System - Charlestown Navy Yard

system, with a combined storage capacity of 1,130,000 gallons. These were constructed for emergency storage during World War II. Figure IV.H.4 is a schematic diagram of the system.

Capacities of the existing fresh water system also are indicated on this figure. The distribution system throughout the Yard is in good condition.

The Metropolitan District Commission receives its water from the Quabbin Reservoir in the Swift and Ware River Watershed, the Wachusett Reservoir in the Stillwater and Nashua River Watershed, and the Sudbury Reservoir in central Massachusetts and distributes it to 34 communities in the Metropolitan Boston area through 250 miles of distribution mains and 14 distribution reservoirs (Figure IV.H.5).

The M.D.C. requires an average of 330,000,000 gallons per day of water and a maximum of 416,000,000 gallons per day when demand rises with temperature; total pumping capacity is over 450,000,000 gallons per day. The quality of the water is excellent. Due to this high quality and drastic restriction on recreational use and public access to reservoirs, no purification facilities are required. Treatment is confined to small amounts of chlorine and ammonia added as water enters the distribution lines.

Salt Water System

A salt water distribution system also is found at the Navy Yard and consists of two distinct systems: a salt water coolant system for the

Other Utilities

As there are no anticipated requirements for the existing compressed air and oxygen distribution systems, these will be discontinued.

Solid Waste

Solid waste material will be generated during both the construction and occupancy phases of the proposed project. Construction activities on the site are estimated to generate the following amounts of solid waste over the completion life of the project:¹

Total construction excavation:	140,000 cu. yds. (207,900 tons)
Total demolition material:	48,780 cu. yds. (102,440 tons)
Total construction material:	10,990 cu. yds. (3,850 tons)

Excavation material is a valuable commodity which can be sold to sur-charge or fill land areas to prepare them for development. It is anticipated that a certain amount of this excavated material will be utilized on-site for landfill and landscaping purposes and that the remainder will be disposed of at one or more development sites in the area or, if such are unavailable, at an approved landfill site. As the material is transported to development or disposal sites, there is the potential for spillage along the haul route, which would increase the ratio of pollutants in the urban run-off in these areas. Based on EPA data, it is estimated that the maximum amount of potential spillage

¹ Construction excavation estimated by BRA Engineering Department; weight based on 110 lbs. per cubic foot. Demolition material estimated by BRA Engineering Department; weight based on 2.1 tons per cubic yard. Construction material estimates based on data from Chatterjee, S., Urban, L.V., and Mickucki, W., "Planning Suffers from Lack of Building and Demolition Debris Data," Solid Wastes Management, February 1975, p. 12.

could be 0.11% of the total excavation material, or a maximum of 228.7 tons over the 10-12 years of the construction period, if all of the material were hauled from the site.

Certain demolition material also has potential reuse value, particularly brick, stonework, steel and wooden structural members, and other masonry and metal components. Much of this material can be recycled for further use or sold for scrap, thus reducing the amount of waste requiring disposal.

Disposition of demolition and construction-related solid waste will be the responsibility of the contractors. Those wastes which are not recycled or otherwise reused will be required to be disposed of at landfill sites approved by the Commonwealth of Massachusetts. At the present time, only two sites are available in the Boston area for demolition debris - at Amesbury and Carver. Both have an expected life of only a year, but a new site has been proposed in Amesbury. The Commonwealth currently has underway a study of potential sites suitable for solid waste disposal.

Occupancy of the Shipyard will result in garbage and other wastes generated by the residential, commercial, industrial, and institutional uses. Based on EPA and other data,¹ it is estimated that full development of the Navy Yard would generate an estimated 10.8 tons of solid waste per day, 3,942 tons per year (exclusive of industrial waste).

¹ See Appendix H.5.

It is anticipated that the City of Boston will be responsible for the collection and disposition of residential solid waste and that other uses will contract with private contractors, as is the current policy. At the present time, the City contracts with Waste Control, Inc. for the collection of solid waste in Charlestown and eventual disposal at two sanitary landfill sites in Amesbury and one in Berkeley. These sites are approved by the Commonwealth. However, the Berkeley landfill site is reaching its capacity and an alternative state-approved site will be needed in the near future. Disposal of non-residential solid wastes is the responsibility of private contractors. It is the City's policy to allow free dumping of refuse collected from non-residential property if the contract is with the same contractor used by the City.

Although no hazardous or radioactive substances are expected to be generated from the site for disposal, the geologic and geographic characteristics of individual landfill sites will be taken into consideration for industrial waste disposal.

3. Impact of Alternatives

(1) "No-Build"

Under a "no-build" alternative, minimal demands for utility services, energy, and solid waste disposal would be placed on the existing facilities. The present utilities are in generally good condition and would be adequate to serve whatever reuse reasonably could be expected to take place in the Yard. Since the power plant would be inoperative, heating and energy requirements would have to be

electrical demand on the Edison system is estimated at 2,045 megawatts and peak winter demand 1,900 megawatts; by the year 1985, peak demand is projected to reach 3,340 megawatts (summer) and 3,100 megawatts (winter). The Charlestown Shipyard development would equal some .2% (summer) to .4% (winter) of the total Edison peak load. The Edison's system capability currently is 3,124.8 megawatts and is projected to continue to rise steadily. Thus it is not expected that the addition of the Yard's electrical load would impose any strain on the Edison facilities.

Since Boston Edison is a participating member of the New England Regional Electrical Generating and Transmission Pool, which supplies electricity from some 55 generating plants located throughout New England, the increased demand on the Edison system cannot be specified to a particular plant but would be spread throughout the system and the resultant air quality impacts would be insignificant. To meet future increased demands for electrical energy, Boston Edison plans the construction of a second nuclear power station at Plymouth.

The availability of energy resources in future decades cannot be projected with any accuracy at this time. The present sources of fuel for the stations in the grid network are coal, oil, and nuclear power. Fuel oil is a scarce resource, especially low-sulphur content oil, and as a result several stations have been converted to coal burning facilities. In addition, Boston Edison anticipates greater reliance on nuclear power in the future, from the present 30% to 50% by 1984.

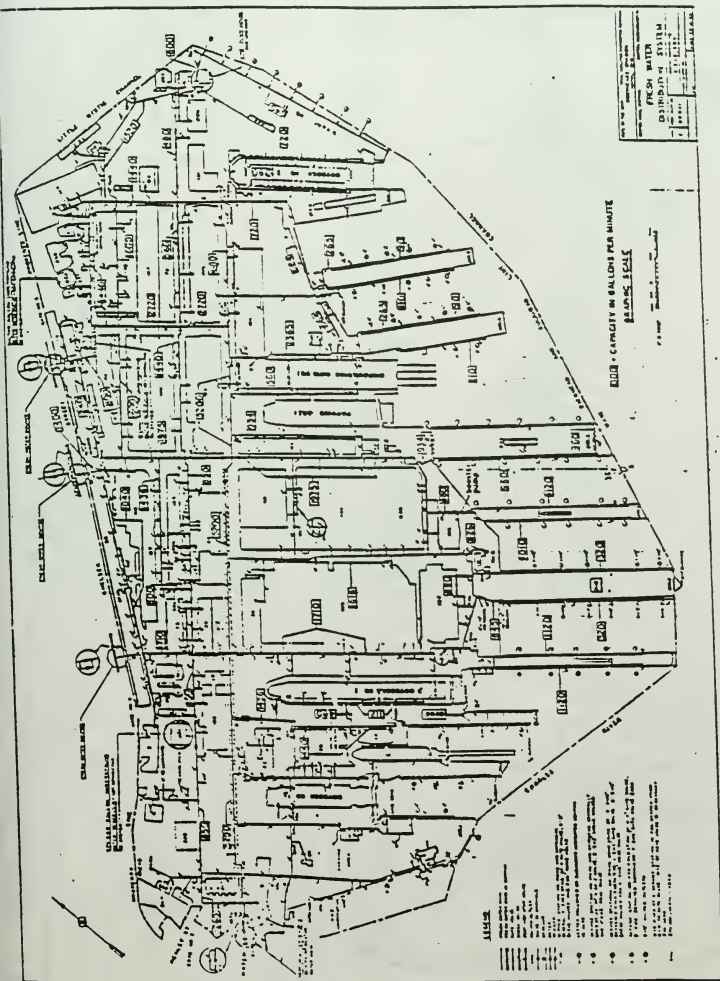
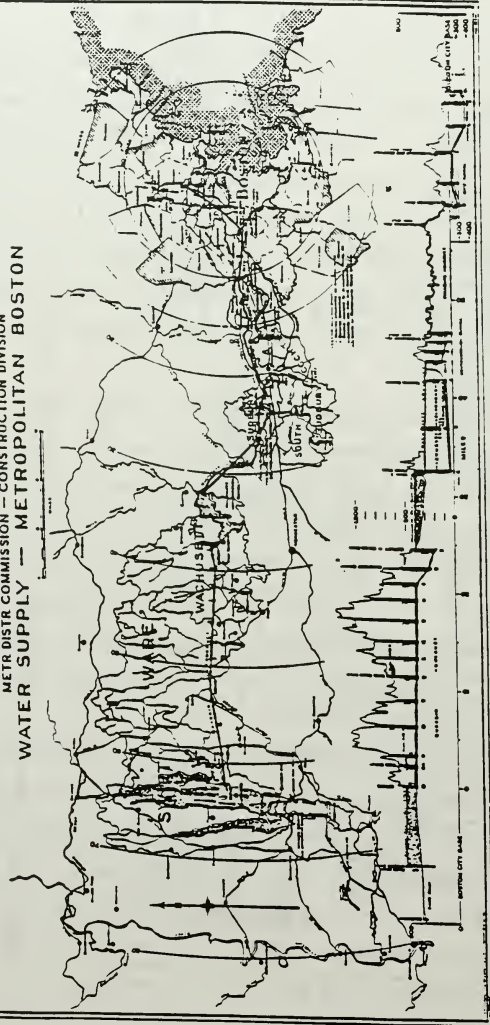


Figure IV.H.4: Fresh Water Distribution System - Charlestown Navy Yard

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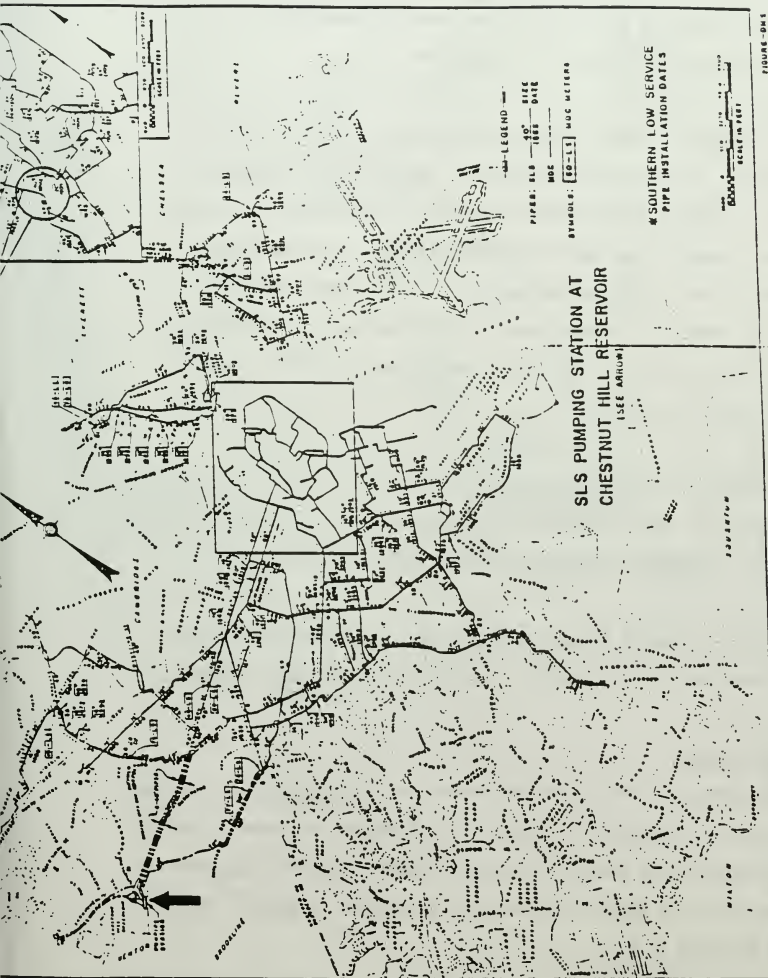


METROPOLITAN DISTRICT COMMISSION
WATER SUPPLY DIVISION

METROPOLITAN DISTRICT COMMISSION
EXISTING WATER SUPPLY SYSTEM

REVISION OF THE 1927
MAP OF THE METROPOLITAN
DISTRICT COMMISSION
WATER SUPPLY SYSTEM

Figure IV.11.5: Metropolitan Boston Water Supply System (MDC)



former power plant, and a salt water fire fighting system servicing the waterfront facilities and installed since 1968.

The cooling system includes a 48-inch pipe leading to Building 191, which contains three pumps of 10,000 gpm, 7,500 gpm, and 5,000 gpm capacity. A 42-inch pipe transfers salt water from Building 191 to the power plant, where it was used to condense steam. Following use the salt water flowed by gravity through a 60-inch pipe to a concrete chamber and thereafter through three 30-inch concrete pipes, arranged in parallel, discharging into the Little Mystic Channel. Flood gates protect these outlet pipes.

The salt water fire fighting machinery is located in Building 191 and provides 125 psi salt water to piers 2 through 7 and to drydocks 1 and 2. Piping is generally 12-inch diameter steel.

A schematic diagram of the system is presented in Figure IV.H.7. Both the coolant and the fire fighting lines are in fair to good condition.

Hot Water System

The hot water distribution system consists of pipes ranging in size from 2½ inches to 12 inches in diameter. Originating at the power plant, the system supplied hot water for heating, domestic and industrial uses.

The entire system was in fair operating condition. A system diagram is shown in Figure IV.H.8.

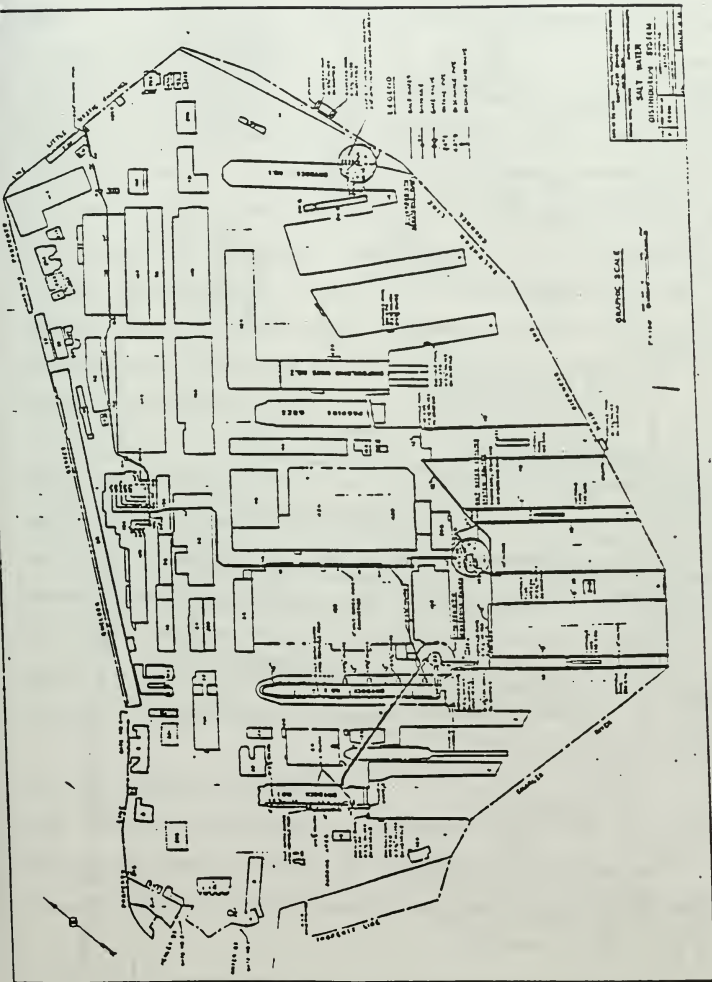


Figure IV.H.7: Salt Water Distribution System - Charleston Navy Yard

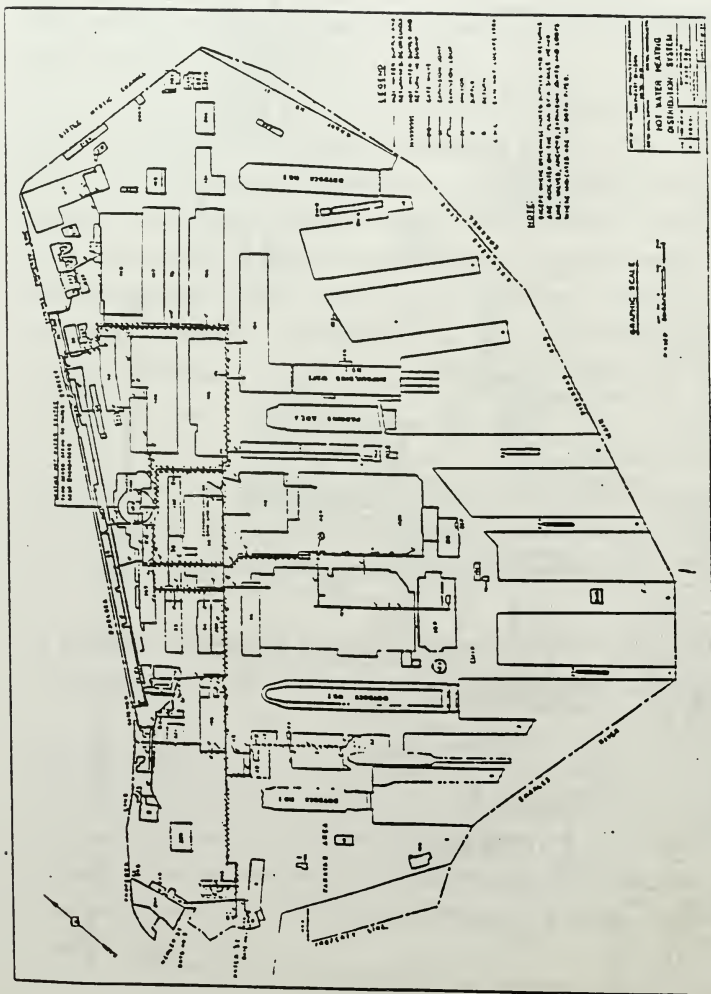


Figure IV.H.8: Hot Water Heating Distribution System - Charleston Navy Yard

Energy

(1) Steam Distribution System

A steam distribution system originated at the former power plant and serviced yard facilities as noted in the schematic diagram in Figure IV.H.9; the system is no longer in use. The steam piping has an average age of approximately 25 years and is steel with welded and/or flanged joints and magnesium insulation. Eighty five percent of the 41,000 feet of piping, the maximum size of which is 10 inches, is above ground; the remaining 15 percent is below ground in concrete utility tunnels. Condensate was not returned to the power plant, but was discharged through the drainage system.

The results of the 1974 field survey and interviews indicated that approximately 90 percent of the piping system was in good condition, and the remaining 10 percent was rated as fair to poor, this portion being primarily along the waterfront. Major problems included large sections of missing or badly deteriorated insulation, steam leaks at some of the expansion joints (particularly where the system was subject to tidal flooding) and deteriorated pipe hangers and guides.

(2) Fuel Distribution System

A No. 6 fuel oil transmission line runs from a filler connection at the Charles River opposite Building 109 to 970,000 gallon storage tanks beneath the surface near the Commandant's residence. The line is an

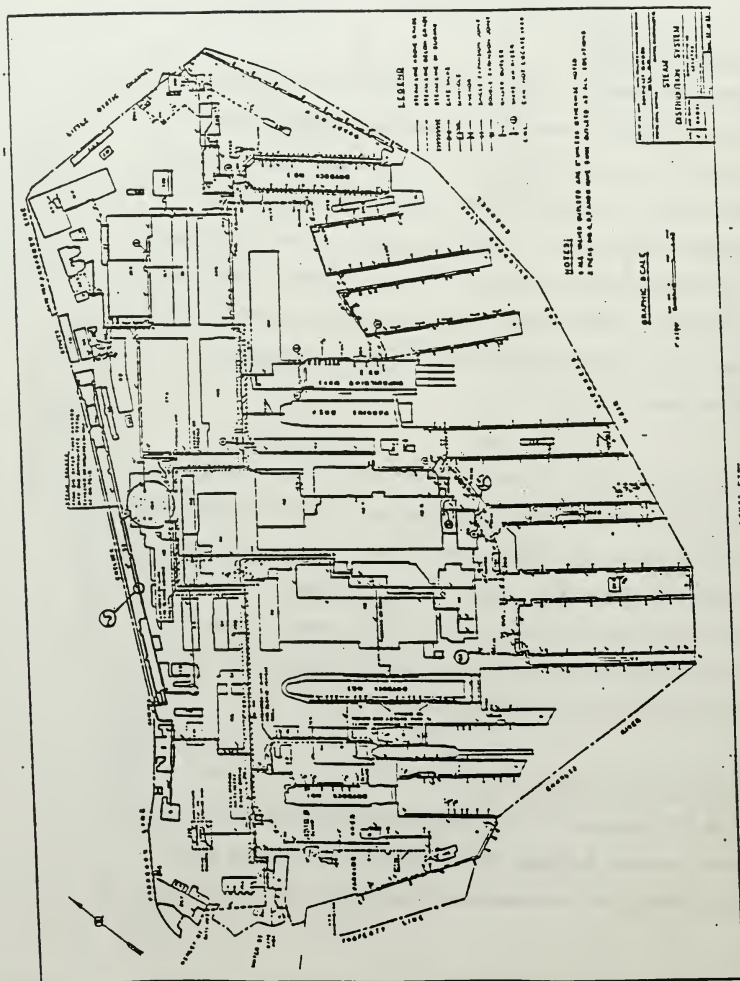


Figure IV.H.9: Steam Distribution System - Charlestown Navy Yard

insulated 8-inch steel pipe, thirty percent of which is above ground while 70 percent is below ground in a utility tunnel. Two 2,000 gpm pumps discharge the oil to two day tanks adjacent to Building 108, each with a capacity of 25,000 gallons. The transmission line terminates at the power plant and is in good condition. The system diagram is shown in Figure IV.H.10.

(3) Gas Distribution System

Natural gas at Charlestown is supplied by the Boston Consolidated Gas Company from three taps: one 8-inch and one 4-inch tap off the Chelsea Street main and one 3-inch tap off the Water Street main. Figure IV.H.11 shows the distribution system. The 8-inch system to the industrial section of the yard is supplied by the northern connection on Chelsea Street but has been disconnected.

(4) Electrical Distribution System

Until the closing of the power plant in the Spring of 1976, electrical power for the Navy Yard was both purchased from the Boston Edison Company at 13.8 kv, 60 hz and generated within the yard at both 13.8 kv and 2.4 kv, with generators operating in parallel with utility and voltage regulators and controls arranged to permit the interchange of power in either direction. Primary distribution is at both 13.8 kv and 2.4 kv, with the systems tied together through two 5,000 KVA transformers. The utility service consists of two three-cabled No. 4 AWG feeders with a total line capacity of approximately 8,400 KVA. Total generating capacity of the power plant was 22,000 kw, consisting of four turbo-

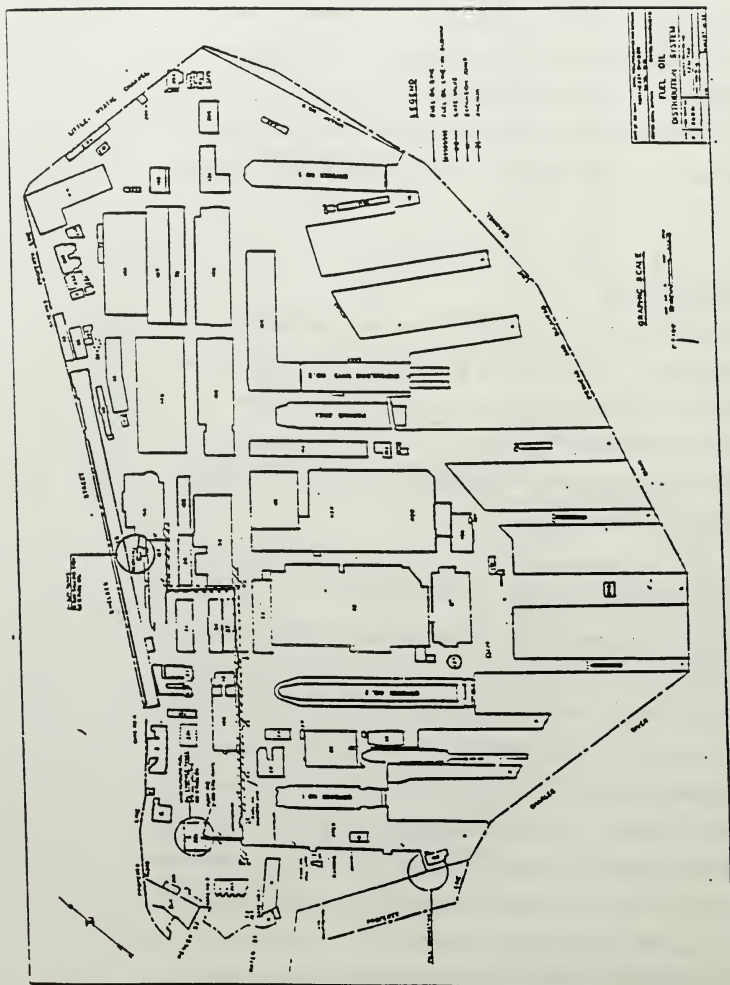


Figure IV.H.10: Fuel Oil Distribution System - Charleston Navy Yard

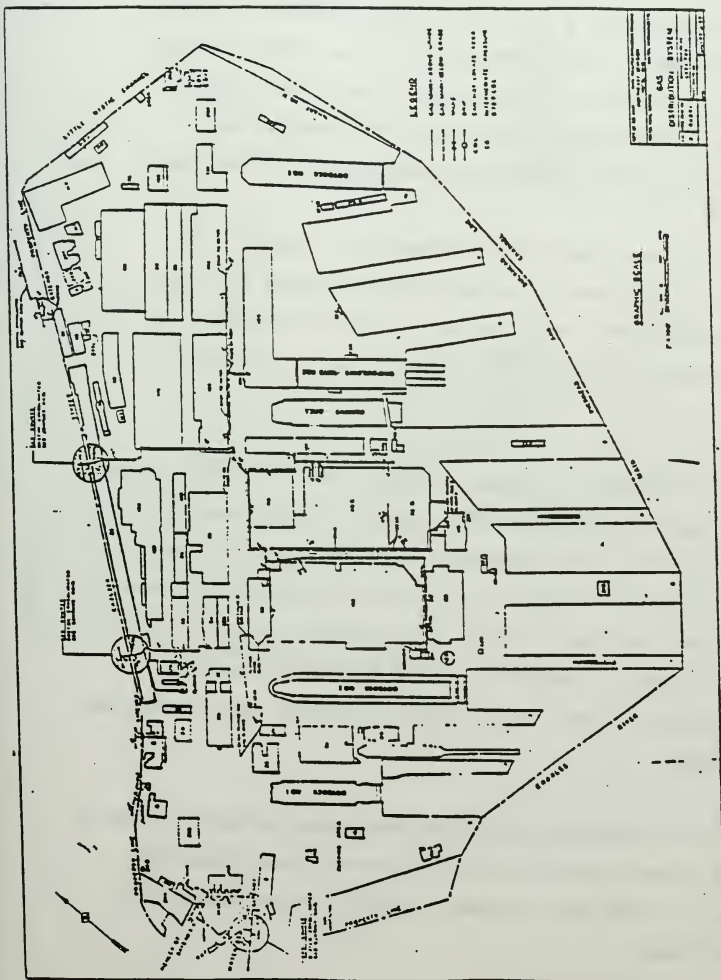


Figure IV.H.11: Gas Distribution System - Charleston Navy Yard

generator units operating at 2.4 kv with a total capacity of 14,500 kw, and one unit rated at 7,500 kw operating at 13.8 kv. Normal operating procedure was to generate the major portion of the Shipyard power requirements, limiting the purchase of power from Boston Edison to approximately the minimum purchase requirements of the service contract.

At the present time, since the yard's power plant no longer is in operation, all electricity is obtained from Boston Edison and is distributed where required through the existing distribution lines. The following description outlines the combined system as it existed in 1974.

Main 13.8 kv switchgear is located in Building 150 and includes incoming feeders from Edison, generator No. 5 breakers, bus tie transformer breakers, feeders to three substations and to the electric furnace in Building 42C. This switchgear is arranged in a split-bus configuration for greater reliability. Utility incoming breakers are of the fixed type (Allis Chalmers Type DZ-100, 250 MVA interrupting capacity). Distribution switchgear is of the metal-clad draw out type (Westinghouse Type DH-150).

The 13.8 kv distribution system feeds three remote switchhouses which in turn feed substations on the various piers with a total transformer capacity of 16,000 KVA, with feeders installed in the shipyard underground system.

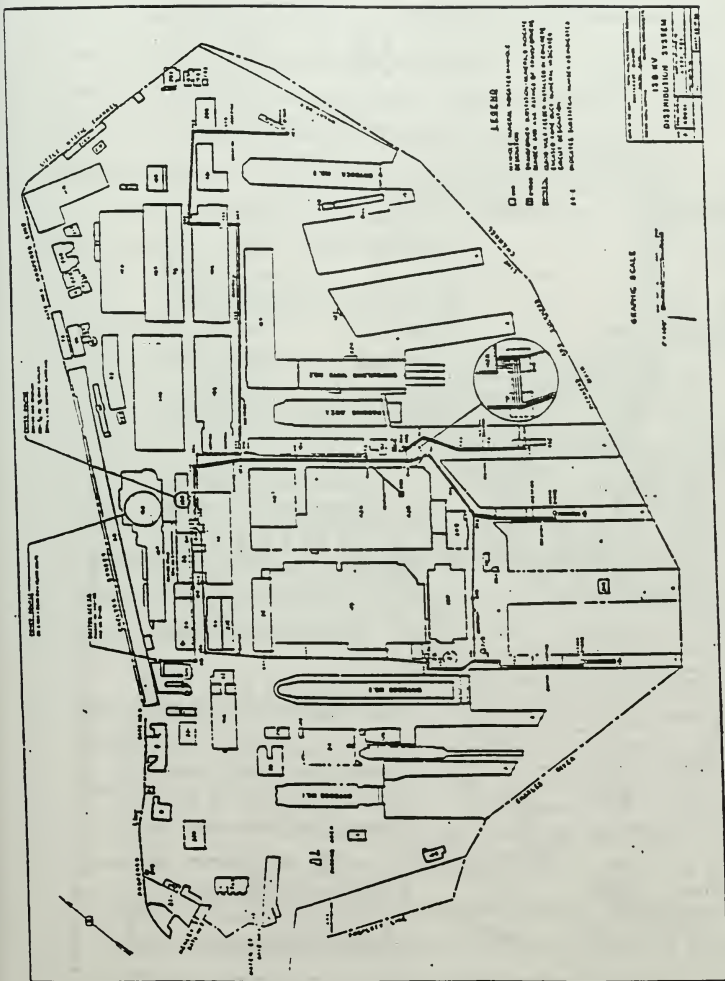


Figure IV.H.12: 13.8KV Electrical Distribution System - Charleston Navy Yard

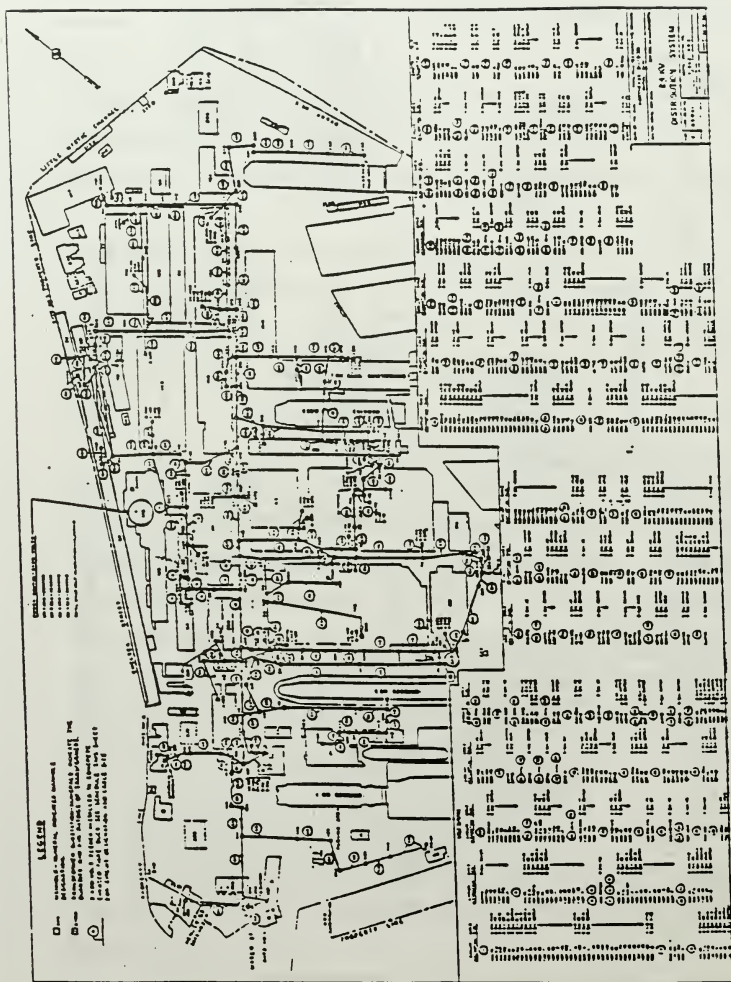


Figure IV.H.13: 2.4KV Electrical Distribution System - Charleston Navy Yard

Main 2.4 switchgear is located in the power house (Building 108) with a newer section and a lighting distribution switchgear installed in the substation (Building 150). The main switchgear consists of a total of 40 breakers arranged in two sections (east bus and west bus) with an emergency tie and with two generator breakers and one 13.8/2.4 bus tie transformer on each section. Age of the equipment varies, some having been installed as long as 50 years ago.

In addition to the main 2.4 kv switchgear in the power house, there is additional switchgear in this building for the supply of power plant auxiliaries, both at 2.4 kv and at lower voltages via transformers. Similarly, a number of additional buildings are supplied at 2.4 kv and have substations with switchgear for supplying larger motors at this supply voltage and transformers for providing lower voltages. Most of this remote switchgear is of the older panel-mounted type. Feeders consist of lead sheathed cables installed in the shipyard underground conduit system.

Secondary 60 Hz voltages are 460 volts, 3-phase; 230 volts, 3-phase; 120/208 volts, 3-phase 4-wire; and 115/230 volts, single phase and are obtained from substation transformers either within the particular building or from an adjacent building substation via the shipyard underground distribution system. In addition, many buildings are supplied with DC obtained from various motor-generator sets and rectifiers either within the building served or from an adjacent building via the shipyard underground conduit system.

Figures IV.H.12 and IV.H.13 show the 13.8 kv and 2.4 distribution systems.

The 13.8 kv distribution system appears from the condition survey to be generally in good condition. The 2.4 kv distribution system, while serviceable, requires upgrading or replacement by expanding the 13.8 kv system if reliable operation is desired. Older units are of obsolete types for which parts are no longer available, and older cables are approaching the end of their useful life. Also, older breakers may not have the proper interrupting capacities for certain reuses.

Other Utilities

(1) Compressed Air System

A compressed air system, with pumps and dryers located in the power plant, supplies the various shops, sewage and water ejector pumps, and the piers and drydocks in accordance with the diagram shown in Figure IV.H.14. The 38,000 feet of steel piping, 90 percent of which is above ground, has an average age of 25 years. The system is in good condition.

(2) Oxygen Distribution System

An oxygen distribution system consists of 1-½ inch to 4 inch diameter steel piping, as shown in Figure IV.H.15, and supplies the drydocks, piers, and several buildings. Liquid oxygen is trucked to the yard and is stored at a 210,000 cu. ft. liquid oxygen tank adjacent to the Little Mystic Channel. The system appears to be in good condition.

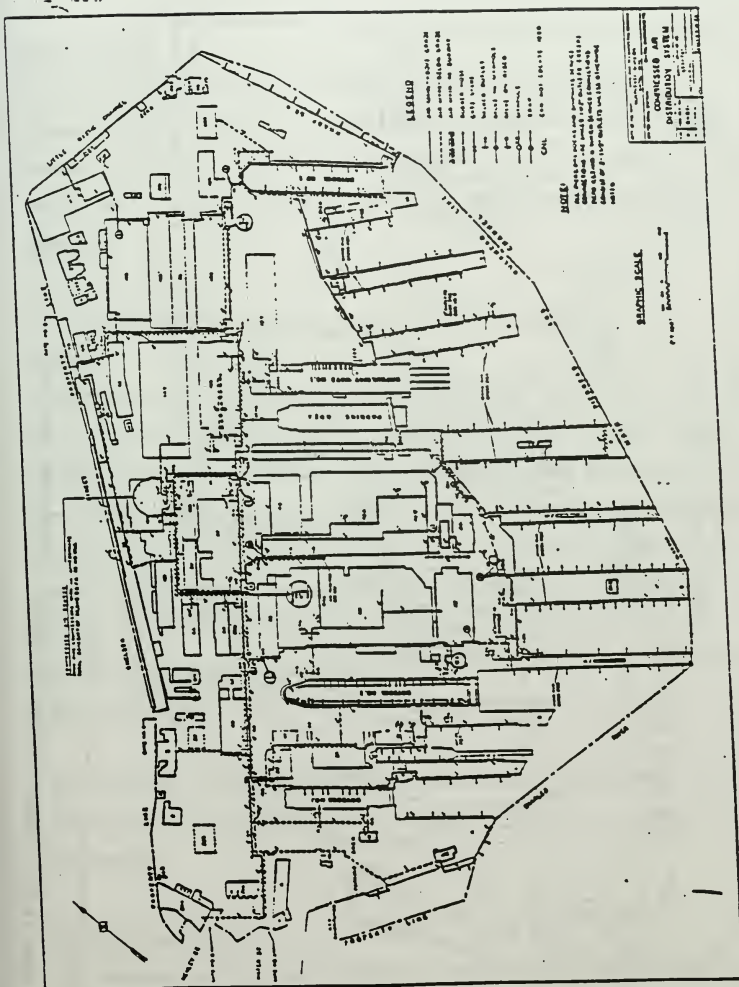


Figure IV.H.14: Compressed Air Distribution System - Charlestown Navy Yard

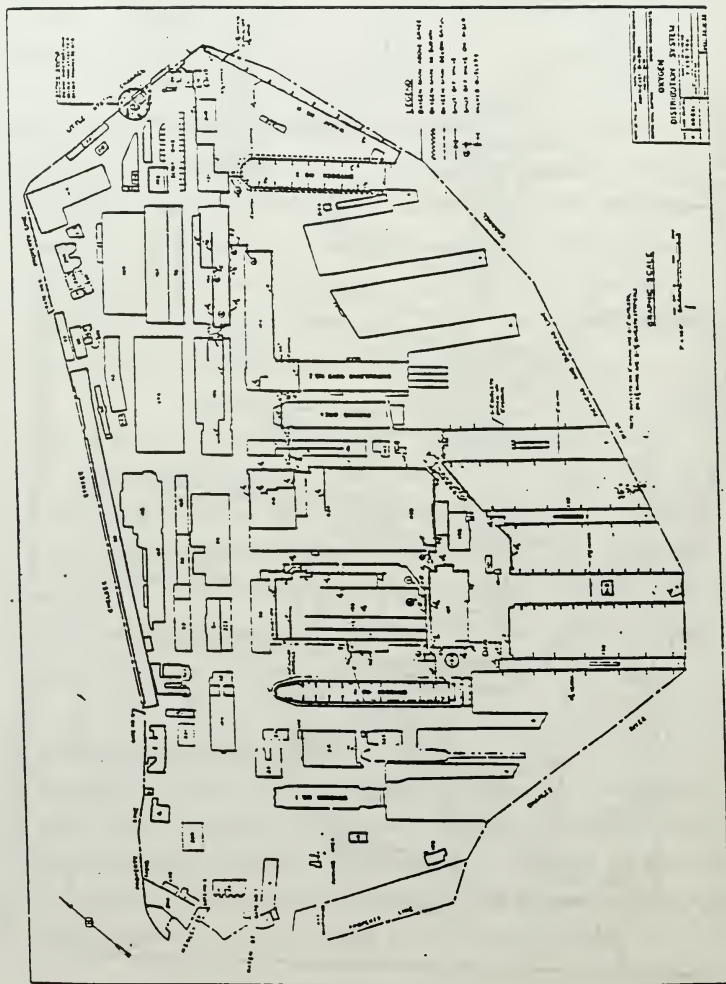


Figure IV.H.15: Oxygen Distribution System - Charleston Navy Yard

Solid Waste

In the past and at present, garbage and solid waste collection and disposal was and is handled by private contractors under contract to the Federal Government. Since the yard currently is not in operation, except for the disposal of surplus property, minimal solid waste is generated.

2. Impact of the Project and Proposed Utility Improvements

General

Current proposals for the Charlestown Navy Yard include the installation of a complete system of new sanitary sewer, storm drainage, water, and lighting systems by the BRA within the Historic Monument Area. As plans are further developed in more specific detail for the remaining portions of the Yard, it is anticipated that additional new utility lines will be installed to serve the proposed development and will be tied into the utility systems of the Historic Monument Area. Consequently, the proposed public utilities of the Monument Area have been sized to handle the requirements for full development of the Navy Yard.

The following sections describe the proposed utility improvements to be installed in the Historic Monument Area and the impact of total project development.

Sanitary Sewer System

The proposed sanitary sewer system will consist of the installation of 10" to 18" lines to tie into the existing MDC trunk line at 2nd Avenue

(see Figure IV.H.16), which cuts through the Navy Yard and connects to the North Metropolitan Trunk Sewer near Sullivan Square. The sanitary system is designed for an average domestic flow of 100 GPCD and a peak domestic flow of 300 GPCD, with infiltration of 750 gallons per mile per day per inch of pipe diameter. Maximum design flow equals peak domestic flow plus infiltration plus allowance for industrial discharge. The sanitary sewage demand created by the total Shipyard development is estimated at 884,500 gallons per day.¹ This flow represents 0.26 percent of the design capacity of the Deer Island Treatment facility and an increase of 0.29 percent of current average flow. In addition, it is estimated that the proposed marina would place a maximum daily load of 2,750 gallons on the Yard's sanitary sewer system from the boat sewerage system (assuming total utilization of the marina and complete discharge into the MDC system; based on an average holding tank capacity of 5 gallons per boat). Plans for the proposed sanitary sewer system have been reviewed and approved with conditions by the Massachusetts Water Resources Commission, Division of Water Pollution Control (see Appendix H.2).

The sanitary flow from the Navy Yard development can be handled adequately by the MDC Charlestown Trunk Sewer, which has a design capacity of 12 MGD and was able to serve Charlestown when it had a population nearly twice that of the present and the Navy Yard employed some 35,000 persons. Projected 1985 residential population for Charlestown is 18,000 (excluding the Navy Yard development), with a daily population in the

¹ For the basis of this estimate, see Appendix H.1.

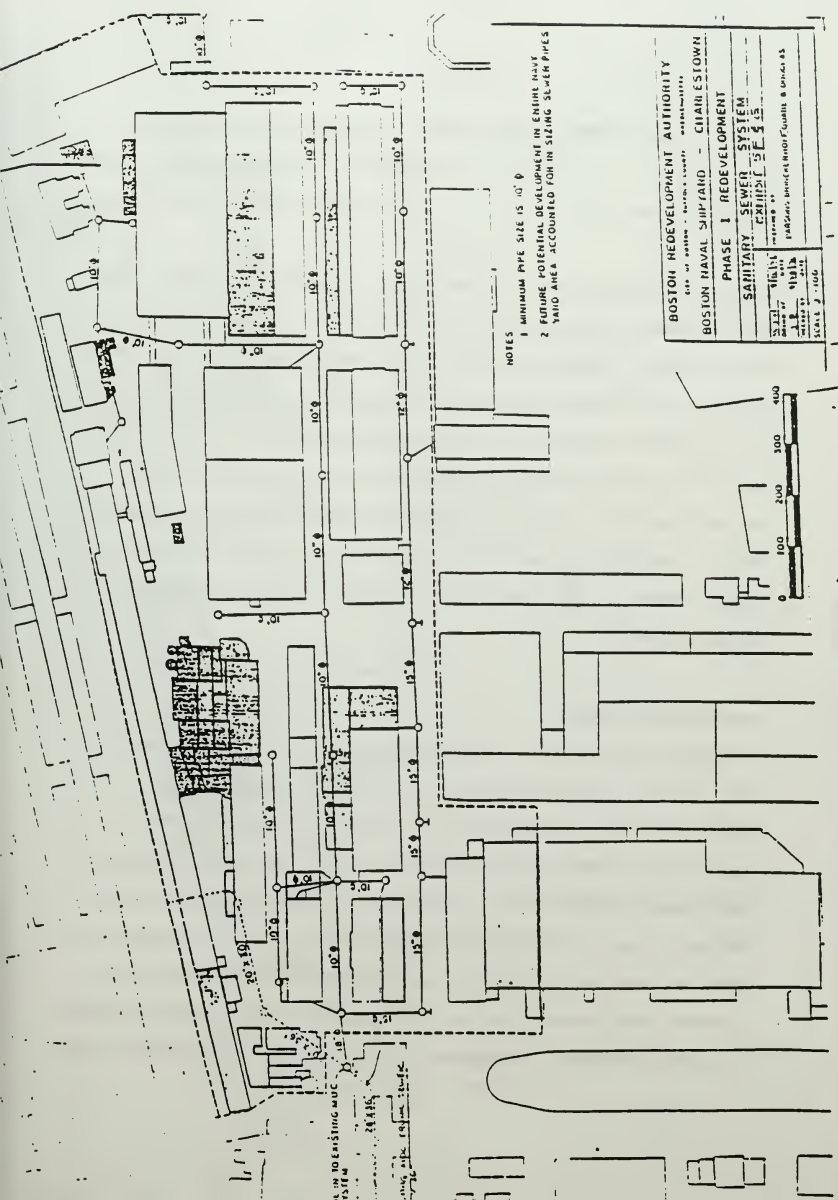


Figure IV.H.16: Proposed Sanitary Sewer System - Historic Monument Area

Shipyards of approximately 10,000 persons. Peak use is estimated at 50-75% of capacity. Therefore, full development of the project area is not expected to place any burden on the sanitary sewer system of Charlestown.

Although the sewerage system in the Shipyards is a separated system, the MDC trunk sewer is combined, with an estimated 50-60% of its flow being storm drainage. Completion of the project improvement program of the Charlestown Urban Renewal Plan, including sewer separation in Main Street and other sections of the Charlestown community, will eliminate nearly all of the combined flow, allowing the trunk sewer to handle sanitary flow only. Overflows from the MDC sewer drain into the Boston Harbor or the Millers River but are reportedly infrequent due to the excess capacity of the trunk line and therefore are not a serious pollution problem.

Storm Drainage System

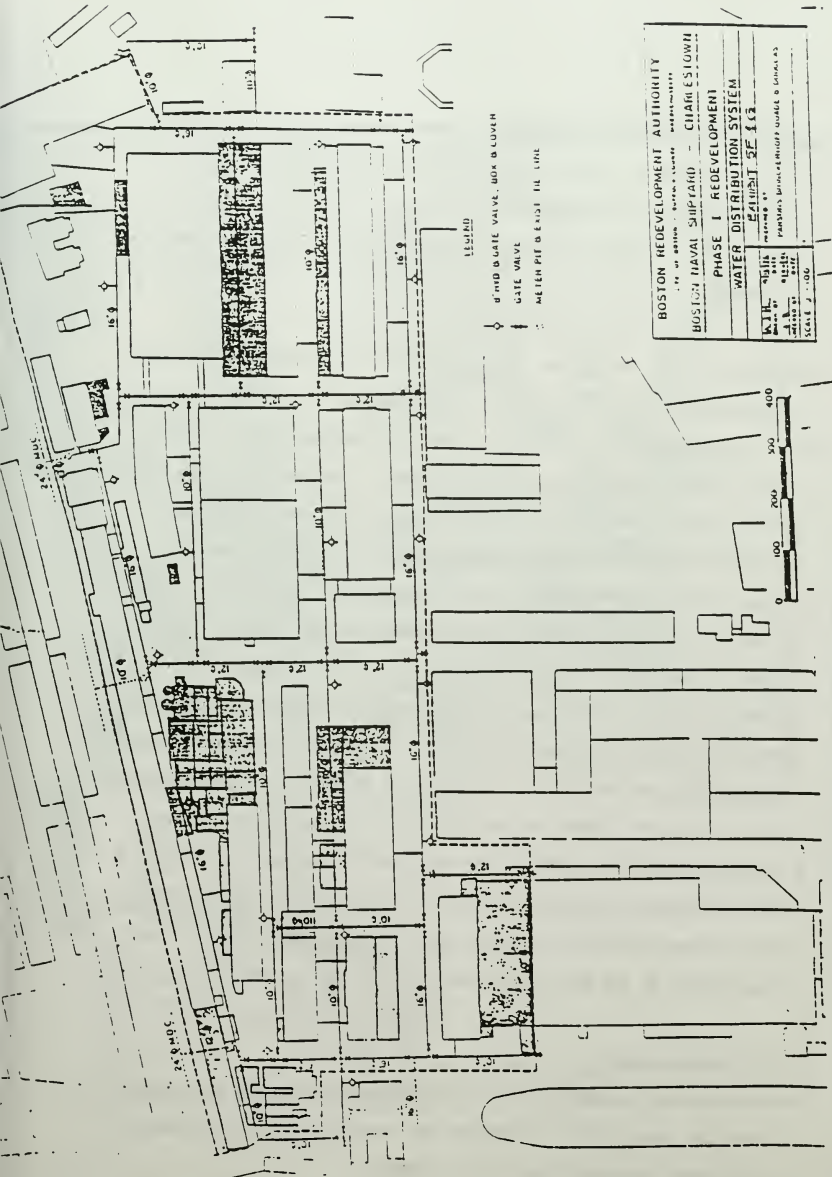
The proposed storm drainage system consists of 10" to 30" pipe which will connect to the existing 60 inch sewer that extends into Boston Harbor along 6th Street extended and into the 60 inch salt water discharge leading into the Little Mystic Channel. The system is designed for a storm frequency range of 10-25 years. Since the present storm drainage system at the Shipyards adequately handles existing runoff and storm drainage, and the proposed development plan will replace some existing paved surface with grass and landscaped areas, total runoff for the Yard is expected to be reduced slightly and no problems are foreseen.

At the present time, no discharge of liquid wastes is anticipated from the Shipyard development. During operation of the Navy Yard, discharges did originate from the power plant and the dry docks. Under current plans, the power plant will be demolished and the dry docks will not be used; therefore, no discharge permits will be required. The existing 60-inch outfall to the Boston Harbor, which will receive only the addition of storm water runoff from the Yard, is covered by a discharge permit issued to the City of Boston by the U.S. Environmental Protection Agency under Section 401 of the Federal Water Pollution Control Act Amendments of 1972. However, since discharge from the outfall originates in Chelsea and Charlestown and is a combined sewer overflow, serious pollution problems do result and in the future the EPA may require some treatment of the wastes or interception of the waste before it enters the Shipyard property (see Appendix H.3).

Fresh Water System

The proposed fresh water system in the Historic Monument Area will consist of a gridiron or loop system of lines 10" to 16" in diameter, which will connect to an existing 24-inch relined main in Chelsea Street. The system will be designed to have sufficient capacity to deliver maximum daily domestic and industrial flow simultaneously with required fire flow. Maximum daily demand is calculated at 150-200% average daily demand, with peak daily demand of 300% average. The average daily demand at full utilization of the Shipyard is estimated at 884,500 gallons,¹ which is approximately 44 percent of the daily con-

¹ For the basis of this estimate, see Appendix H.1.



BOSTON REDEVELOPMENT AUTHORITY	
100 N. STATE ST. - SUITE 1000	REDEVELOPMENT
BOSTON NAVAL SHIPYARD - CHARLESTOWN	
PHASE I REDEVELOPMENT	
WATER DISTRIBUTION SYSTEM	
EXHIBIT 2E-1C	
DATE: 10/1/88	SCALE: 1" = 100'
BY: [Signature]	FOR: [Signature]
PREPARED BY: BOSTON REDEVELOPMENT AUTHORITY	

Figure IV.H.18: Proposed Water Distribution System - Historic Kontinental

sumption of 2,000,000 gallons measured during operation of the project area as a shipyard in 1960-61. The City of Boston currently (1974) utilizes an average daily demand of approximately 145 million gallons. The Navy Yard development, therefore, will increase total City demand by .61 percent.

Maximum dependable safe yield from the present MDC sources is estimated by the Commission at 300 MGD. As of 1975, however, the MDC system was operating at 330 MGD, or 10 percent above the dependable safe yield. Projected 1985 water consumption of the member communities of the MDC water system is approximately 441 MGD. In order to meet this demand, the MDC has established specific development programs. Two major projects under consideration to increase dependable safe yield include the Northfield Mountain Water Supply Project and the Millers River Basin Project (see Figure IV.H.19). Under the Northfield Project, the Massachusetts Legislature has approved the diversion of water from the Connecticut River Watershed for MDC use. The planned completion date is prior to 1984 and the yield is estimated at 72 MGD. The second project, which would direct water from the Millers River Basin, a tributary to the Connecticut River, could yield additional supplies of 48 MGD to 76 MGD, depending on the method of development employed. Implementation of both of these projects, therefore, would increase water supply capacity from 300 MGD to 372 MGD in 1984 and up to 448 MGD by 1990.

Salt Water Systems

The salt water system will be eliminated in the proposed development. Since the power plant is scheduled for demolition, the requirement for a salt water coolant system will be removed.

Hot Water System

Demolition of the power plant also will eliminate utilization of the existing hot water system in the Yard. Future requirements will have to be met by individual water heating units in the respective buildings.

Energy Requirements

(1) General

With the programmed demolition of the power plant (which ceased operation in the Spring of 1976), all energy requirements for the Yard will have to be met by individual building units or by outside sources. Electrical requirements will be supplied by Boston Edison Company. Since gas is not expected to be supplied to the Shipyard, heating of the buildings will be provided either by on-site furnaces or boilers utilizing fuel oil or by purchased electricity. Electric heating is planned for the first stage of the new housing development (rehabilitation of Building 42 and the construction of 10-20 townhouses) but no decision has yet been made on the type of heating to be furnished for the remainder of the housing. Plans for the other project elements also have not advanced to the stage that energy sources and needs can be identified. Any on-site fossil fuel facilities will be required to comply with applicable air pollution regulations of the Commonwealth of Massachusetts.

The existing steam and fuel oil distribution systems in the Yard will be discontinued and any future requirements will have to be filled on an individual building basis.

(2) Gas Distribution

No use of gas as an energy source for the Navy Yard development is currently proposed. Due to the existing supply situation and anticipated shortages in future gas resources, Boston Gas has indicated that it would not be in a position to guarantee supply to any major new customers. In addition, the existing distribution lines in the Yard do not meet present Boston Gas Company standards and will be salvaged as part of the site development program.

(3) Electrical Distribution

Future electrical requirements for the Shipyard development will be met by Boston Edison Company. At the present time, negotiations are underway with Edison for their use of the existing 13.8 kv and parts of the 2.4 kv systems. While the 13.8 kv system is in general satisfactory condition, upgrading or replacement of much of the 2.4 kv system probably will be necessary due to the age and obsolescence of the system and its equipment. Additional lines will be necessary to serve the proposed new residential area. According to Boston Edison Company, no problems are foreseen in providing the electrical requirements for the Shipyard development (see letter, Appendix H.4).

It is estimated that full utilization of the Shipyard would require approximately 8,650 kva of electricity (or 6,920 kw at an overall power factor of 80%) during the summer peak and 15,900 kva (12,720 kw during the winter peak.¹ According to Boston Edison Company, peak summer

¹ Summer peak assumes air conditioning in all buildings; winter peak assumes all buildings heated electrically. Figures do not assume abnormal industrial requirements. Data furnished by Boston Edison Company (personal communication with Craig Pepper, Manager of Commercial Department).

provided on-site in individual buildings or be purchased from private utility companies. No problems would be anticipated in the provision of necessary services and, due to the greatly reduced scale of development, resulting impacts would be significantly lower than the proposed project would produce.

(2) Alternative Development Options

Since the alternative development options considered for the development of the Navy Yard envisioned a less intensive overall development, utility and service demands would, in general, be reduced correspondingly.

With the alternative housing/institution/industry option, it is estimated that water usage, sanitary sewerage loads, energy demands, and solid waste generation would be approximately 60% of that of the planned development. Based on the engineering survey of the site, the water and sanitary sewer lines serving the proposed housing/hotel/retail area of this option are of questionable capacity to meet the demands of these suggested uses and would require replacement with new lines. Water supply to the remainder of the site would be adequate, and the system is in reasonably good condition. Likewise, the sanitary sewer system in the proposed institutional and industrial section would appear adequate to meet demands and would need only minor upgrading and repair work. As in the proposed development, the Yard's electrical system would require

major upgrading by either complete replacement of the 2.4 kv lines and equipment or by removal of this system and expansion of the 13.8 kv system to serve the entire site. Demolition of the power plant would require each building to supply its own heating source and the purchase of electricity from Boston Edison.

Under the industrial/institutional option, utility and energy demands are estimated at 50% to 80% of the proposed project, although these demands could exceed the proposal under consideration were extensive heavy industry included in the alternative. The existing site infrastructure would be retained for the industrial and other uses and would be upgraded where necessary to a level of acceptability. Some extensive work or replacement, especially on the piers, would be required, and the Yard's electrical system would need major renovation. The existing power plant would be retained under this alternative and would supply all the heating and most, if not all, of the electrical requirements.

Storm drainage requirements under the alternative development proposals would be generally the same as the proposed project, although probably slightly higher since less of the site would be landscaped, particularly under the industrial/institutional option. However, runoff would not be increased over the current situation.

Because of the lesser intensity of development, solid waste generation under the alternative residential/institutional/industrial option would be less than the proposed project. Under the industrial/institutional alternative, the composition of solid waste generated would differ significantly from the proposed project, being primarily industrial in nature. The amount and type generated would be dependant on the specific industries that would occupy the Shipyard, some of which could have special disposal requirements. A certain percentage also probably could be sold as scrap or otherwise recycled.

(3) Shipyard Reuse

Under this alternative the original use of the project site would be revived and the existing utilities would again serve the purpose for which they were designed. Demand on the utilities and services could be expected to exceed that of the proposed project by a significant amount, although the demand would not be expected to approach that which occurred during the intensive activity of World War II. Limited data available for more recent utilization of the Shipyard indicate that water consumption approximated 2,000,000 gallons per day (1960-61) and electrical requirements approximated 1,000,000 KWH per month (1974). These requirements were adequately met by the existing utility systems and facilities at the Yard and would be able to be met in any future shipyard use. As noted previously, most of the systems could achieve a level of acceptability

with only minor repair work; a few, such as the electrical system, would require extensive work or complete replacement. The existing power plant would be retained under this alternative and would be upgraded both to serve the Yard and to meet current air pollution standards. While compliance with standards and the use of appropriate pollution control equipment would be required, operation of the power plant would still result in an increase of pollutants at the site and consequently in some degradation of the ambient air quality.

IV.I. NOISE¹

1. Noise Measurement

The noise environment of a typical urban area is generally defined by an ambient, or steady "background" noise, which is the sum of many different noise sources upon which is superimposed the noise of individual local sources, such as passing vehicles or occasional aircraft flyovers.

Noise levels are commonly measured on an A-weighted decibel scale, or dB(A), which simulates the human perception of noise, particularly its annoying aspects. Since the dB(A) scale is logarithmic, changes in dB(A) levels do not follow simple arithmetic relationships. Thus, if the sound energy in any area is doubled, there will be a measured increase of only 3 dB(A), which is barely detectable. To the human ear, however, sound will appear twice as loud with an increase of approximately 10 dB(A).

In assessing potential noise impact, both the time fluctuations of the noise level and the maximum noise levels are important. Noise fluctuations may be described by determining those levels exceeded a certain percentage of time. Hence, for a specific time period, the L_{10} level describes the noise level exceeded 10% of the time and is generally indicative of higher noise levels occurring during the time period and, in the case of urban communities, indicates the character of localized traffic noise sources. The L_{50} level represents the median noise level.

¹ Much of the data and analyses contained in this section have been obtained from: FHWA/Mass. DPW, Draft Negative Declaration, Chelsea-Water Streets Connector... (1976), Chapter 5C and Appendix F.

In addition to absolute noise levels, an increase to the existing ambient will be perceived as an intrusion or impact by people who customarily use an affected area. Changes in noise levels create an impact which is roughly proportional to the increase. Empirical studies have shown that, in an urban environment, people can begin to distinguish changes in noise levels of approximately 5 dB(A). Lesser changes are generally considered insignificant and imperceptible. For changes above 5 dB(A), it is commonly accepted that increases of 5-15 dB produce "some impact" while noise level increases of more than 15 dB are usually considered severe.

2. Noise Level Criteria

In order to assess noise impact, standards relating to community noise impact have been established by some governmental agencies. For purposes of this impact report, Federal Highway Administration (FHWA) standards have been adopted, due to the prevalence of highway-related noise as the principal noise source affecting the Navy Yard. FHWA criteria specify various design noise level limits for highway noise during the noisiest traffic hours in areas occupied or used by people. The outdoor noise limit is $L_{10} = 70$ dB(A) for virtually all types of land use except especially quiet parks, where the limit is 60 dB(A). Therefore, the $L_{10} = 70$ dB(A) criterion applies to most of the planned uses in the Yard. Industrialized land areas have a 75 dB(A) limit.

3. Ambient Noise Levels

In the northeastern section of Charlestown, noise comes from two sources: the steady portion is due to the presence of many distant sources, principally motor vehicles in and around Charlestown, and a fluctuating portion is due to nearby sources such as traffic, aircraft flyovers, construction, voices and other street activity. The most obvious source of noise in the area is the considerable truck and automobile traffic on the double-decked Tobin Bridge. Its acoustical influence extends to 200 to 500 feet out on each side of the bridge. The noise and its source are most obvious north of the Kent School area where the bridge is elevated well above the surrounding buildings.

In general, traffic on the Tobin Bridge creates noise levels of $L_{10} = 70$ dB(A) on a line parallel to and approximately 130 feet from its edge, although significant variations occur due to the surrounding topography, height of the bridge structure, and the shielding effect of buildings. Occasional overflights by aircraft using Runway 33L at Logan Airport produce peak levels of 80 to 85 dB(A) on the ground. Other noticeable noise sources include industrial activities along the East Boston waterfront, which, though not especially prominent, are readily discernable on the harborside area of the Navy Yard site.

Field measurements of existing ambient noise levels were made in 1972 and 1975 in connection with proposed highway improvement projects in

Charlestown, in accordance with FHWA approved procedures.¹ Eighteen sensitive receptor sites were chosen for study (see Figure IV.I.1), and the results of the L_{10} and L_{50} dB(A) measurement program are shown on Table IV.I.1. Since the traffic volumes and other urban commercial activities remain reasonably uniform throughout the day, the noise level was found to be nearly constant from about 7 a.m. to 5:30 p.m. on each weekday.

As at most urban sites, noise is dominated by trucks; hence noise on weekends, holidays and between the evening and morning rush hour will be generally less. Although nighttime noise levels in the residential areas were not measured, other data indicate a decrease of about 10 to 12 dB for areas far (over 500 ft.) from major highways and 4 to 8 dB for areas closer to such highways. The minimum noise level occurs in the early morning hours, between 1 and 4 a.m.

A small but highly probable decrease in the measured ambient noise was found between 1972 and 1975. For those sites near the Tobin Bridge ramps where bridge traffic noise predominates, there was an average drop of 3 dB, reflecting a significant reduction in overall traffic, particularly trucks, during the busiest daytime hours. Traffic flow data for these two years indicate an ADT reduction from about 77,000 to 66,000 vehicles for an average weekday. Although this change in daily volume alone could not account for the observed reduction, the remaining noise level drop may be due to a relatively greater decrease in noisy types of trucks operating during the peak traffic hours. This latter fact could not be confirmed.

¹ See FHWA/Mass. DPW, op.cit., Appendix F.

TABLE IV.I.1: EXISTING AMBIENT NOISE LEVELS
IN CHARLESTOWN DURING WEEKDAY RUSH HOUR PERIODS¹

Location	Year	Measured Noise Levels dB(A)		Principal Sources
		L10	L50	
Water St./Foss St.	'72	75	69	HW, L
Off Ramp/Wapping St.	'72	74	67	HW
*	'75	71	69	HW
Shipyard - Bldg. 24	'75	70	64	Yard Activities
Shipyard - Commandant's House	'75	69	66	HW
Shipyard - Gate 5/5th Ave.	'75	71	68	HW
YMCA/City Square	'72	76	70	L, HW
On/Off Ramp/Henley St.	'72	84	75	HW, L
Winthrop Sq./Adams St.	'72	73	66	L, HW
Chestnut St./Adams St.	'72	75	66	HW, L
58 Chestnut St.	'72	64	58	L
Prospect St./Edgeworth St.	'72	66	63.5	HW, C, L
*	'75	66	64	HW, L
Lowney Way/Tremont St.	'72	81	75	HW, L
*	'75	77	73	HW, L
Monument Sq./Tremont St.	'72	63.5	58	L, C
*	'75	62	56.5	L, C
Bunker Hill St./Tufts St.	'72	72	68	L
Vine St./Hunter St.	'72	75	70	HW, L
*	'75	72	69	HW, L
Barry Playground	'75	70	68	HW
Medford St./High School Site	'75	70	64	L

* = Comparasion site to test validity of 1972 data for 1975 conditions

HW = Limited Access Highway and Ramp

L = Local Street

C = Children/Pedestrians

1. FHWA/Mass. DPW, Draft Negative Declaration, Chelsea-Water Streets Connector..., (1976), p. 60.

4. Future Noise Level Projections

Future L₁₀ dB(A) noise level projections have been prepared for sixteen specific sensitive receptor sites within or adjacent to the Navy Yard. These receptors are distributed at various distances from the Tobin Bridge as well as at isolated critical points such as residential areas or community facilities. The predictions, using approved FHWA procedures,¹ are based on peak hour traffic volume projections resulting from the proposed intensive utilization of the Shipyard and assume the implementation of recommended Chelsea-Water Streets improvements.

Results of this analysis are graphically shown on Figures IV.I.2.a and IV.I.2.b and are presented in Table IV.I.2.

In addition, recent EPA studies indicate that average levels of urban noise can be characterized reasonably accurately on the basis of population density alone. Such values have been computed for the Charlestown area and are as follows:

<u>Year</u>	<u>Population</u>	<u>Mean Noise Level (L₁₀ dB(A))</u>
1975	17,500	68 ± 6
1985	20,000	68.5 ± 6
1995	22,500	69 ± 6

This range of values agrees closely with the range of ambient noise levels obtained by field measurement and have been used where local traffic data are not available.

¹ See FHWA/Mass. DPW, op.cit., Appendix F.

TABLE IV.1.2: PREDICTED TRAFFIC NOISE LEVELS FOR PEAK HOUR
TRAFFIC ON WEEKDAYS AT SIXTEEN RECEPTORS¹
(L₁₀ db(A))

Receptor	1975 Existing	1985	1995
1. Shipyard, Gate 1	*	73	79
2. Shipyard, Bldg. 24	70	62 ²	63 ²
3. Shipyard, Commandant's house	69	75	77
4. Shipyard, 4th Ave. and 9th St.	*	71 ²	72 ²
5. Shipyard, 5th Ave. near Gate 5	71	70 ²	70 ²
6. Lowney Way at Tremont St.	81	78	78
7. Prospect St. and Edgeworth St.	66	66	66
8. Kent School (New)	*	74	74
9. Decatur St. at Samuel Morse Way	*	75	76
10. Barry Playground	70	72	72
11. Medford St. at Tufts St.	*	73	73
12. Medford St./High School Site	70	73	73
13. Bunker Hill St. at Lexington St.	*	74	74
14. Monument Sq. at Tremont St.	62	68.5 ¹	69 ¹
15. Winthrop Sq./Adams St.	73	68.5 ¹	69 ¹
16. City Square	76	87	87

* - No field data obtained

1 - estimated value used for lack of local street traffic data

2 - does not include effects of traffic within shipyard

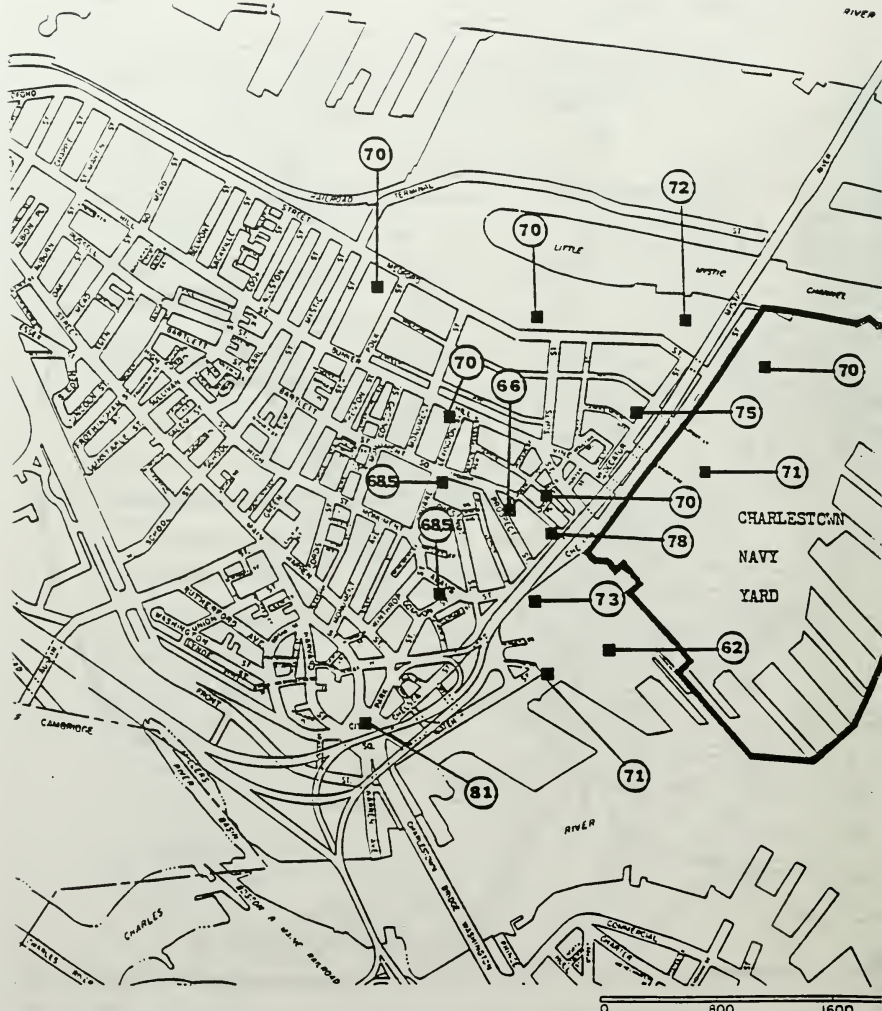
1. FHWA/Mass. DPW, Draft Negative Declaration, Chelsea-Water Streets Connector..., (1976), p. 60.




 ← Noise Level
 in L_{10} dB(A)
 — Receptor Site

Figure IV.I.1: AMBIENT NOISE LEVELS - 1972 & 1975
(Weekday Rush Hour)

Source: FHWA/MASS DPW, Draft Negative Declaration, Chelsea-Water
Streets Connector..., (1976), Appendix F).



 Noise Level
in L_{10} dB(A)
 Receptor Site

Figure IV.I.2.a: CALCULATED PEAK HOUR TRAFFIC NOISE - 1985
(Urban D_{in} L_{10} = 68.5 dB(A))

(source: FHWA/MASS DPW, Draft Negative Declaration, Chelsea-Water
Streets Connector (1974))

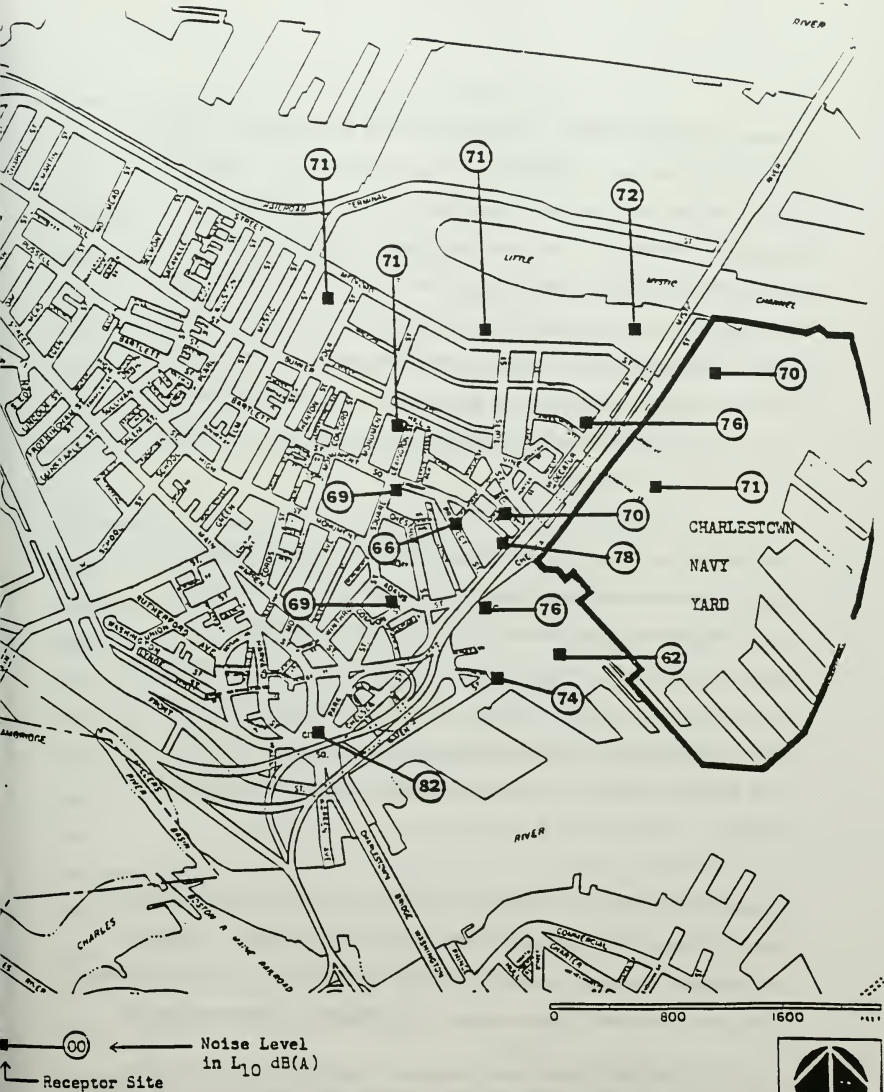


Figure IV.1.2.b: CALCULATED PEAK HOUR TRAFFIC NOISE - 1995
(Urban D_{in} L_{10} = 69 dB(A))

Source: FHWA/MASS DPW, Draft Negative Declaration, Chelsea-Water Streets Connector.... (1975). Appendix 2.

In general, predicted 1985 and 1995 noise levels at the various receptor sites vary by less than 5 dB(A) (increase or decrease) from measured existing ambient conditions and therefore will not be particularly noticeable. More significant increases (over 5 dB(A)), however, are predicted for the City Square and Monument Square areas.¹ With the diversion of trucks from Lowney Way as a result of the Chelsea-Water Streets improvement, noise levels in the immediately adjacent residential areas are expected to decrease, although the $L_{10} = 70$ dB(A) level still will be exceeded along the Tobin Bridge corridor (as well as along all major arterials in the area).

Based on the predicted 1985 and 1995 noise levels, the proposed new housing site along the waterfront falls within the $L_{10} = 70$ dB(A) limit. Predicted noise levels within the Historic Monument Area, however, where some additional housing is proposed, slightly exceed the $L_{10} = 70$ dB(A) limit (by 1 dB(A)). Use of appropriate noise attenuation measures in the architectural treatment of residential buildings in this area will be required to lessen any adverse impact from external noise sources.

In addition, evaluation of the HUD noise assessment guidelines indicates that, although all proposed housing areas would be normally acceptable with regard to automobile traffic on the Tobin Bridge, the New Development Area would be normally unacceptable for residential construction when

¹ For the Monument Square area, however, predicted levels were based on EPA population density criteria whereas existing levels were measured. If density criteria were used for the current situation, the increase would be an insignificant 1 dB.

considering truck traffic, and the Historic Monument Area would be clearly unacceptable (see Appendix I.3). However, a visit to the site during a normal weekday revealed that, due to the distance factor and the presence of several large buildings (which buildings will be retained) between the Bridge and the new housing sites along the waterfront, which act as sound buffers, the impact of vehicular noise from the Tobin Bridge would not be particularly noticeable and in all probability would be absorbed by normal urban residential noises within the housing area. At the same time, the site visit also revealed that the East Boston waterfront noises generally were more noticeable at the site.

With respect to aircraft noise, the most recent (1975) noise contour study for Logan Airport shows that the site lies on the 30 Noise Exposure Forecast (NEF) contour line. For locations at the NEF 30 and lower levels, few activities will be affected by aircraft sounds; however, for areas at higher levels, frequent complaints will occur and the noise will occasionally interfere with some activities. According to the Federal Aviation Administration, the noise situation at the Charlestown Navy Yard in 1980 and later should be no worse than at present and may even be improved somewhat through implementation of aircraft noise abatement methods. However, any reduction is not expected to be substantial as aircraft departing on Runway 33L proceed over the Chelsea Creek and Mystic River area for overall noise reduction in the residential areas of Chelsea, and this operating pattern will continue into the foreseeable future (see FAA letter, Appendix I.4).

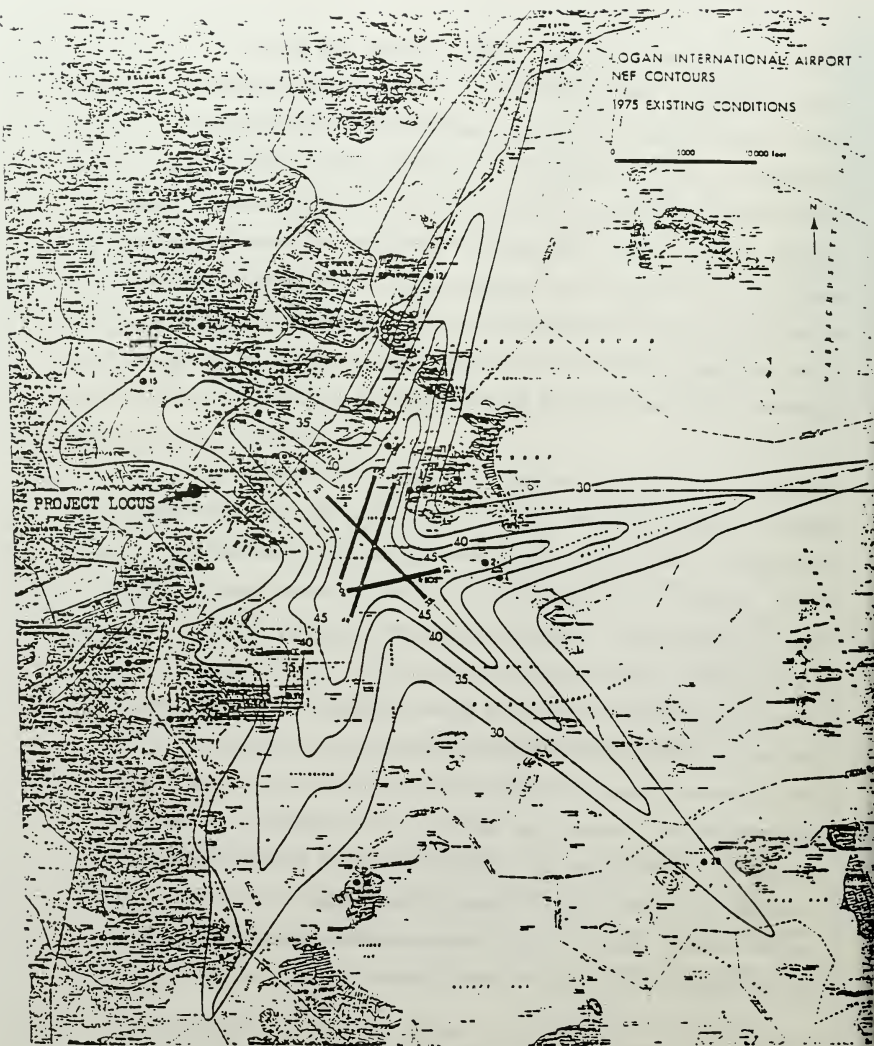


Figure IV.I.3: 1975 Noise Exposure Forecast Contours, Logan International Airport
(Bolt, Beranek, and Newman, Inc.)

5. Short-Term Noise Impacts of the Project

Short-term noise impacts, during the construction period of the proposed developments, will result primarily from demolition and construction activities. The ambient noise environment of the Yard will be affected by a noticeable increase in noise levels during the working hours from various pieces of equipment and trucks, which produce fairly high levels of noise. Typical noise levels from various types of construction equipment are indicated in Figure IV.I.4 and range from 70 to 100 dB(A). The loudest type of equipment is the pile driver, with peaks of 105 dB(A). Existing soil conditions will require the use of pile driving equipment in certain sections of the New Development Area. Pile drivers also will be required for the marina construction.

For demolition equipment, field measurements in the City of Boston indicate ranges from 78 to 86 L₁₀ dB(A), measured at a distance of 50 feet. Major noise source was engine noise of the crane or bulldozer under observation; other on-site noises included heavy trucks in low gear, falling debris striking the ground, and the crane clamshell bucket striking the structure.¹

Maximum noise levels would exist if all equipment were operating simultaneously. In reality, however, all equipment is not expected to be operating at one time, or near one point, and some pieces may be below

¹ Resource Planning Associates, Inc., Final Environmental Impact Statement for the Clearance of Unsafe Buildings, Community Development Block Grant Program (City of Boston), Cambridge, January 1976, p. 92.

		NOISE LEVEL (dBA) AT 50 FT					
		60	70	80	90	100	110
EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES	EARTH MOVING	COMPACTORS (ROLLERS)	H				
		FRONT LOADERS	-----				
		BACKHOES	-----				
		TRACTORS	-----				
		SCRAPERS, GRADERS	-----				
		PAVERS			H		
		TRUCKS		-----			
	MATERIALS HANDLING	CONCRETE MIXERS		-----			
		CONCRETE PUMPS			H		
		CRANES (MOVABLE)		-----			
		CRANES (DERRICK)			H		
	STATIONARY	PUMPS	H				
		GENERATORS		-----			
		COMPRESSORS		-----			
IMPACT EQUIPMENT		PNEUMATIC WRENCHES			-----		
		JACK HAMMERS AND ROCK DRILLS			-----		
		PILE DRIVERS (PEAKS)				-----	
OTHER		VIBRATOR	-----				
		SAWS		-----			

Note: Based on Limited Available Data Samples

FIG. IV.1.4: CONSTRUCTION EQUIPMENT NOISE RANGES¹

¹ U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances (NTID 300.1), Dec. 31, 1971.

TABLE IV.I.3. TYPICAL RANGES OF NOISE LEVELS AT CONSTRUCTION SITES WITH A
70 dB(A) AMBIENT TYPICAL OF URBAN AREAS¹

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial, Parking Garage, Religious, Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches		
	I	II	I	II	I	II	I	II	
Ground Clearing	84	83	84	84	84	87	84	84	Energy Average dB(A) Standard Deviation NPL
	6	8	6	8	6	8	6	7	
	100	103	99	103	101	103	100	101	
Excavation	88	76	89	79	89	74	89	79	Energy Average dB(A) Standard Deviation NPL
	7	5	6	2	7	1	6	2	
	106	98	104	85	106	77	105	85	
Foundations	81	81	78	78	78	78	88	88	Energy Average dB(A) Standard Deviation NPL
	7	7	3	2	3	3	8	8	
	99	100	85	85	85	85	108	108	
Erection	82	71	85	76	85	74	79	79	Energy Average dB(A) Standard Deviation NPL
	6	1	5	1	7	2	3	4	
	97	75	97	79	103	80	88	88	
Finishing	88	74	89	76	89	75	84	84	Energy Average dB(A) Standard Deviation NPL
	7	4	6	4	6	3	6	6	
	106	84	104	86	104	84	100	100	

I - All pertinent equipment present at site

II - Minimum required equipment present at site

¹U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances (NTID 300.1), Dec. 31, 1971.

grade and thus shielded. In addition, since sound relationships are logarithmic, two or more machines producing the same noise energy would only add 3 dB(A) each; and, if one noise source is much louder than the other, the lower one will not be heard or measured in the overall sound level. Moreover, continuous or semi-continuous operation of construction equipment allows individual noise sources to blend in with other ongoing construction activities. Pile drivers, however, because of their intermittent generation of noise, are a more prominent noise source and therefore more susceptible to disruption and annoyance.¹

Although both demolition and construction activities will produce noise levels greater than 5 dB(A) over ambient conditions, the impact of this activity on the adjacent Charlestown community is not expected to be significant, for the following reasons:

- (1) For the most part, demolition and construction activities will take place on the harborside area of the Yard, at a distance from 300 to 800 feet from the closest residential areas.
- (2) Activities will take place during normal working hours, when ambient conditions are already high from the existing traffic.
- (3) The construction site is shielded from the Charlestown residential areas by existing buildings (due to barrier attenuation, receptors that are completely blocked from a noise source by rows of buildings may realize a noise reduction of 10 to 15 dB(A)) and by the Tobin Bridge, where high traffic noise levels would tend to absorb the general construction noise.

¹ For typical ranges of noise levels at urban construction sites, see Table IV.1.3.

However, since the construction activities will be spread over several years, completed developments within the Yard will be impacted by on-going construction taking place elsewhere in the Yard. In addition, until the Chelsea-Water Streets improvement is completed, construction-related truck traffic from the Yard may temporarily increase noise levels on the Charlestown streets. To minimize this impact, care must be taken in specifying truck routes to avoid residential areas to the greatest extent possible.

6. Long-Term Noise Impacts of the Project

Long-term noise impacts will be produced by additional traffic generation, building mechanical systems, and specific land uses. The impact on the Charlestown community of traffic produced by full development of the Navy Yard has been described previously (see "Future Noise Level Projections" above).

Within the Yard, noise levels will increase over existing conditions, since the property today does not support any activity and existing noise levels are essentially those of background traffic. While actual levels cannot be accurately predicted at this stage of plan development, the previously-noted EPA-calculated energy levels of urban noise can provide a reasonable estimate.

Building mechanical systems, located in and on buildings can and do introduce noises that will impact the surrounding environment. Unlike some traffic noise sources, these systems radiate noise in the same

metals (Table IV.E.4). The fact that concentrations in the Inner Harbor are greater than those of the Outer Harbor indicates that the sources of the metals is primarily industrial waste entering the Inner Harbor through sewage and runoff. The high levels are significant since even in very low concentrations these metals are toxic to aquatic life. The toxicities of individual metals, moreover, are synergistic to each other. For example, small traces of copper greatly magnify the toxicity of heavy metals. The toxicities vary considerably with pH, DO, hardness, and temperature. As a general rule, the total concentration of heavy metals should not exceed 1.0 mg/l.

Other parameters measured in the analysis of water quality, such as color, taste, and smell, cannot be quantitatively defined but are used as indicators of the presence of toxic or hazardous substances. Water temperature also is a significant element of water quality analyses. Temperatures throughout the Inner Harbor range from about 58° F to 72° F from June to October. Extreme high readings can be found throughout the year at point sources where industrial cooling water is being discharged into the Harbor. The significance of this thermal pollution is that certain species of fish begin to feel stress above 58° F and that increased temperature is a variable contributing to the depletion of dissolved oxygen.

For a healthy aquatic environment, it is recommended that oil in a natural water body not exceed 15 ppm, and that there be no visible oil slicks on the water surface. There are no available data on quantities

Figure IV.E.3
TRACE METAL SAMPLE SITES
IN BOSTON INNER HARBOR

Source: New England Aquarium, Research
Department, Trace Metal Analysis
of Boston Harbor Waters and
Sediments, Boston, July 1972.

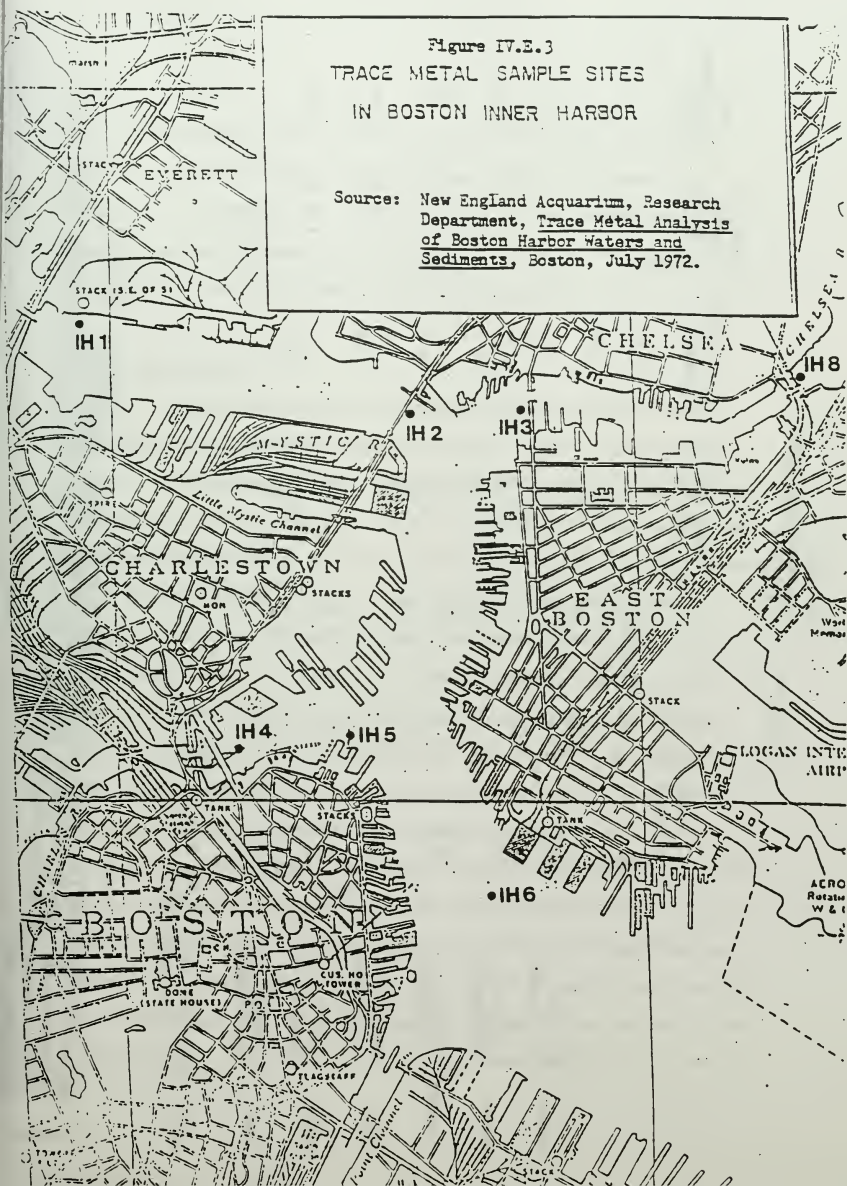


Table IV.E.4
Heavy Metals in Boston Inner Harbor¹
(1972)

	Inner Harbor Sampling Stations			Inner Harbor Average	Outer Harbor Average	Naturally Occurring in Marine Waters ²	EPA Recommended Limits ³
	1H-2	1H-4	1H-5				
Cadmium	0.53 N.D.	0.46 N.D.	0.47 N.D.	0.42 N.D.	0.29	0.11	10
Copper	6.5 2.2	6.6 2.1	4.7 2.3	5.0 1.8	4.4	0.9	50
Chromium	0.58 0.47	2.24 2.56	1.01 1.17	1.90 2.12	3.5	0.2	100
Lead	2.5 5.3	10.6 7.3	8.6 6.3	5.4 6.4	4.4	0.03	50
Nickel	8.3 1.2	9.9 1.3	8.7 1.6	7.8 1.6	8.0	6.6	100
Zinc	62.2 2.6	30.6 3.8	24.7 4.3	40.2 3.7	13.9	5.0	100

NOTE: All values in Parts Per Billion (PPB)
N.D. = Not Determined.

1. New England Aquarium, Trace Metal Analysis of Boston Harbor Waters and Sediments, 1972, p.13.

2. Oceanic Average, from K.K. Turekian, Oceans, Prentice Hall, 1968, p.92

3. National Academy of Sciences/Natural Academy of Engineering, Water Quality Criteria, 1972, (EPA-R3-73-033), Washington, 1972.

of oil in the Inner Harbor; however, oil is clearly present in the bottom sludge and fish taken from the Harbor have had the smell and taste of oil. Patches of oil also are visible on the surface water. Other than affecting aquatic life, floating oil is a significant degrader of the aesthetic quality of the Inner Harbor.

Sources of Pollution

The major factors which degrade the water quality of the Inner Harbor are combined sewer overflows, debris and refuse dumped into the Harbor, oil, treated wastes and sludge from the Deer Island and Nut Island waste treatment facilities, raw waste outfalls, tributary streams, waste from ships and pleasure boats, and storm water runoff. Each of these factors is in itself a complex problem. However, one of the most detrimental sources of pollution is combined sewer overflows in and surrounding the project area. Sixty-five outlets discharge into the Inner Harbor and into the Chelsea River and tidal portions of the Mystic and Charles Rivers - tributaries to the Inner Harbor. The majority of these discharge sites correspond to the sampling station locations indicated in Appendix F.3. The outfall at Vine Street Extended (Sampling Station #120) between Piers 4 and 5 is the only combined sewer overflow located directly within the Shipyard. The Vine Street system serves the area west of Chelsea Street but does not take in sanitary sewage from the project area (the Shipyard is under a separated system in which sanitary waste discharges into the M.D.C. system at Water Street outside of the project area). The effect of the combined sewer outfalls is to raise

Table IV.E.5

Discharge from the Combined Sewer Overflow⁽¹⁾ at Chelsea Street
and Estimated Discharge from Storm Sewer⁽²⁾

	Storm Sewer Mean	Combined Sewer Overflow	
		Range	Arithmetic Mean (5 Samples)
Temperature (°C)		22	22
Dissolved Oxygen (mg/L)		5.4-12.2	8.2
Biological Oxygen Demand (mg/L)	19	2.4-6.8	4.2
pH	7.5	6.8-8.0	7.5
Total Coliform (MPN/100 ml)	58,000	910-460,000	106,000
Fecal Coliform (MPN/100 ml)	10,900	91-93,000	28,000
Suspended Solids (mg/L)	210	0-11	3.6
Color (S.U.)	81	22-65	40
Turbidity (JTU)	170	1-2	1.5
Total Alkalinity (mg/L)	59	65-110	88
Chlorides (mg/L)	12	7,400-15,600	12,300
Salinity (g/L)		13.6-28.7	22.6
Total Phosphorus (mg/L)	0.8	0.12-0.22	0.15
Total Kjeldahl Nitrogen (mg/L)	2.3	0.8-1.5	1.2
Ammonia-Nitrogen (mg/L)	0.6	0.05-0.39	0.2
Nitrate-Nitrogen (mg/L)	0.4	---	---

NOTE: These samples were not flow proportional

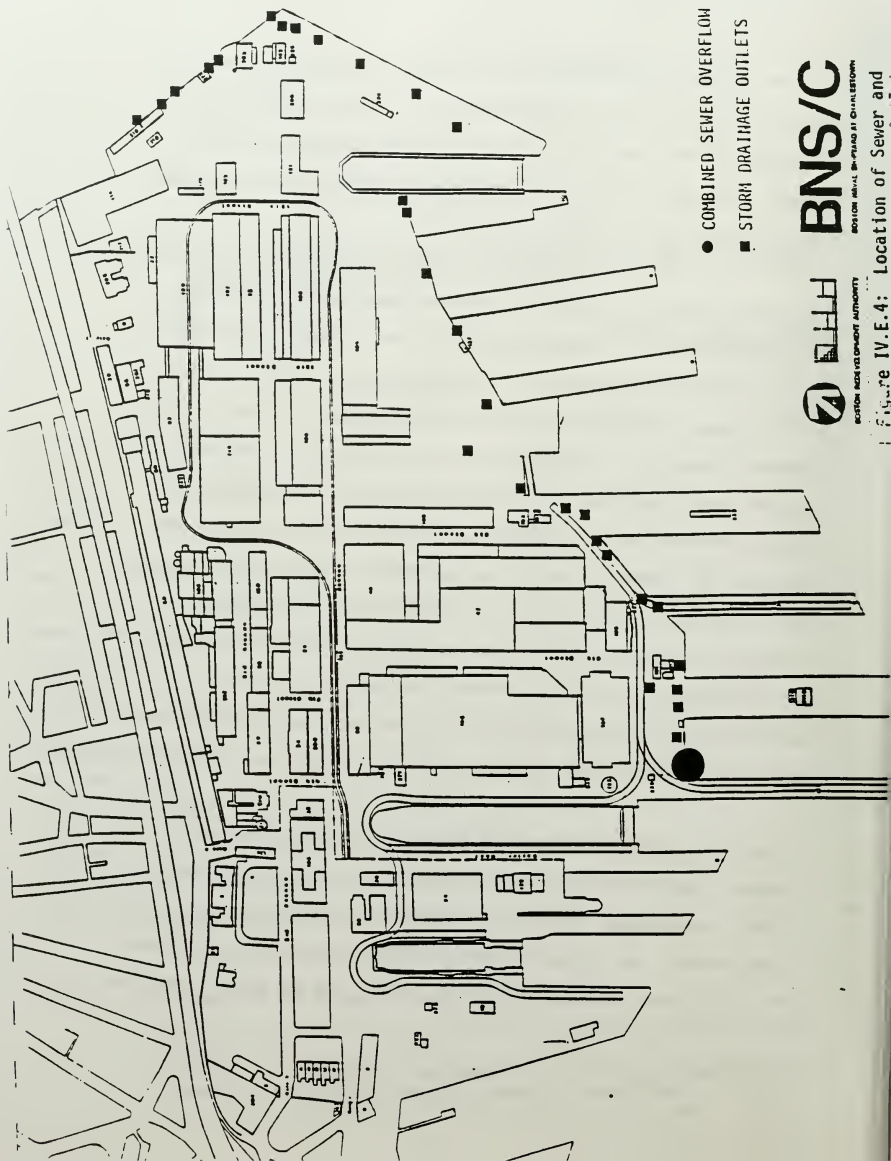
(1) Massachusetts Division of Water Pollution Control, 1973.

(2) Weibel, et.al., "Urban Land Runoff as a Factor in Stream Pollution,"
Journal Water Pollution Control Federation, June 1964.

coliform, nitrogen, and phosphorus levels, and to increase the amount of oxygen demanding wastes and suspended solids. Typical combined sewer overflow discharges contain 5×10^6 total coliform bacteria per 100 ml., 410 mg/l suspended solids, .4 mg/l phosphorus, 10 mg/l of total Kjeldahl nitrogen, and 11 mg/l of BOD_5 .

A second major pollution source is discharge from storm sewer outlets. Storm drainage from the Shipyard enters the Inner Harbor and the Little Mystic Channel from approximately thirty outlets that range from 6" to 30" in diameter (see Figure IV.E.4). Urban stormwater typically contains substantial amounts of pollutants which can contribute to a variety of problems, including pollution of the receiving waters, overloading of sewage treatment plants, and decreased efficiency of the sewer system. Sources of pollutants are debris and contaminants from streets, dust and debris from open spaces, publically-used chemicals, air-deposited substances, ice-control salts, fecal contamination from dogs, and dust and contaminants worked off or emitted from vehicles. Typical concentrations of various pollutants from storm runoff water, which often may be considerably higher than raw sewerage, are indicated on Table IV.E.6.

In addition to the obvious problem of dealing with the tremendous volumes of pollutants entering its water, the Inner Harbor is particularly vulnerable to the adverse effects of the pollutants due to its configuration. The irregular profile of the shoreline, sedimentation and filling that have occurred over the years, wave and wind action, and



● COMBINED SEWER OVERFLOW

■ STORM DRAINAGE OUTLETS



ALUMINUM POLYMER ELASTOMERS

SELECTIONS FROM THE SHIPBOARD AT CHARLESTON

Figure IV.E.4: Location of Sewer and

Table IV.E.6
Pollutant Loading from Urban Runoff
Charlestown Navy Yard

<u>Pollutant Parameter</u>	<u>Loading Rate¹</u> <u>(lb/curb mile/day)</u>	<u>Pollutant Loading</u> <u>from Navy Yard²</u> <u>(lb/curb mile/day)</u>
Total Solids	730	5,343.6
Volatile Solids	51	373.3
BOD ₅	4.5	32.9
COD	26.	190.3
Kjeldahl Nitrogen	0.66	4.83
Nitrates	0.029	.212
Phosphates	0.37	2.71
Total Heavy Metals	1.3	9.5
Total Pesticides	200	1,464.0
	<u>(10⁹org./curb mile)</u>	<u>(10⁹org./curb mile)</u>
Total Coliform	99	724.7
Fecal Coliform	5.6	41.0

¹ Average rate of accumulation, from Sartor, James D. and Boyd, Gail B.,
Water Pollution Aspects of Street Surface Contaminants (EPA-R2-72-081),
Washington, November 1972.

² Based on 3.66 miles of streets and pedestrian ways within the Charlestown Navy Yard development area.

its position in relation to the Outer Harbor all are factors contributing to reduced dispersion patterns and inhibiting tidal flushing. The net effect is inadequate dilution and flushing of pollutants entering the Inner Harbor.

2. Impact of the Project

The proposed project is not expected to have any significant adverse effects on water quality in the Inner Harbor, although water quality will be temporarily impacted during the demolition and construction period. An increase in suspended solids in the surface runoff could result from extensive grading and excavation activities, from building demolitions, and from wetting down of the site to reduce dust emissions. If chemical stabilizers are used, the potential for additional water pollution would exist. Turbidity of the water will be increased by stirring of the bottom sediment during work to remove existing piers and piles and to construct the marina facilities and harborside housing. Increased turbidity indirectly may cause a reduction in DO by inhibiting the penetration of light and thus photosynthesis. However, when construction activity ceases, suspended particles will settle and the water should return to a state of equilibrium within five to seven days. There is no dredging proposed in the development of the Shipyard and construction of the marina facilities, and therefore large quantities of polluted bottom sludge would not be introduced into the water column.

When development is completed, suspended particles carried by surface runoff should be less than under existing conditions in the Shipyard.

Under present plans, all storm drainage will be channeled into catchment basins which will outflow into the surrounding water at only two points (into the Inner Harbor at Sixth Street extended and into the Little Mystic Channel) rather than through the several direct drains as at present. Siltation should occur in the catchment basins, which should be cleaned periodically to reduce the amount of particles reaching the water. Soluable oils, however, would not be filtered out by this system. In addition, the inclusion of more vegetative covering should reduce the flow of runoff into the Harbor. There is a strong possibility, however, that fecal contamination of runoff from dogs and other animals could increase significantly if pets are allowed in the development. Such contamination is a serious contribution to the deterioration of surface water quality in the urban environment. Also, substantial increased vehicular usage of the site and the proposed open parking areas would add greater amounts of vehicle-related pollutants to the surface runoff.

The marinas to be constructed at the Shipyard will have a capacity for approximately 550 boats. A small amount of normal oil discharge is expected from the operation of the marine motors. However, this is not expected to significantly impair water quality or interfere with the attainment of the water quality goals for the Inner Harbor. The flushing action of waters where the marinas are to be constructed should be adequate to disperse and dilute any small quantity of engine oil, which would be far less than that generated by the original activity at the Shipyard. In addition, recreational boating is a legitimate and desired

use for the Inner Harbor and is in accordance with the Harbor's water quality criteria.

No decision has been made on the inclusion of on-site fuel storage for the marinas. If fuel storage should occur, possible adverse effects on water quality could occur from accidental spillage. Such occurrences can be minimized through proper design and construction of any storage facility.

The marinas are not expected to interfere with currents in this portion of the Inner Harbor, since most of the piles will be spaced at intervals greater than 10 feet and the channel is relatively deep where the marinas are to be constructed (21 to 35 feet in depth). Where piles are to be clustered in the vicinity of piers 8, 9 and 10, the clusters will be spaced at 10-foot intervals and should not interfere with current flow. The clusters may be vulnerable to trapping and accumulating suspended debris. However, the marinas' design, with lanes open to the main channel, should provide for sufficient flushing action between pilings.

After completion of the proposed project and habitation of the Shipyard, sanitary sewerage will flow into the improved separated system. Therefore, increased sewerage from the Shipyard will not result directly in combined overflow into the Inner Harbor. However, the sewerage will enter the M.D.C. combined system which does contribute considerable pollution to

the Harbor in the form of combined overflows. Separation of sewers is currently underway or planned in Charlestown and other areas of Boston to reduce this problem.

3. Impact of Alternatives

(1) "No-Build"

Under the "no-build" alternative water quality would not change appreciably from existing conditions. However, the "no-build" option would preclude the improvement of the storm drainage system that would reduce the amount of pollutants entering the Inner Harbor.

(2) Alternative Development Options

The water quality impacts of demolition and construction involved in the alternative development options would be similar to those of the proposed project but lesser in degree. Temporarily increased turbidity levels would decrease proportionally with the amount of pier demolition and new construction involved in each option. The temporary effects of pile driving would be reduced under the residential/institutional/industrial option, which would have fewer marina facilities. No pile driving would be proposed under the industrial/institutional package, although the existing deteriorated piers would be removed. Ship-related industrial activity in this option would adversely affect water quality through increasing occurrences of higher turbidity, oil spillage, and potential contamination from chemicals, metal particles, paint, etc. Since

neither of the alternative development options proposed as large a landscaped area as the present proposal, the amount of storm water runoff from the alternatives would be greater and, in the industrial/institutional option, would probably equal that currently discharged from the site.

(3) Shipyard Reuse

Development of the site for use as a ship building and repair facility would have a significantly greater adverse impact on water quality than would the proposed redevelopment or other alternatives. The large vessels docking and leaving the facility would interject oil into the water during operation, and oil spillage would be more likely to occur on a large scale. Chemicals, particles used in abrasive blasting, and paint scraped from ship hulls being cleaned would contaminate the water, and storm water pollution would increase with the absence of any vegetative covering at the waterfront.

IV.F. BIOLOGY

1. Existing Conditions

Vegetation and Wildlife

The Shipyard has maintained its urban character since its inception early in the 19th century. The area under study is nearly entirely paved, and vegetation either exists as it is maintained by man as part of the landscaping effort, or grows as weeds and undergrowth in spite of adverse conditions. The majority of the vegetation in the Shipyard is concentrated in the area surrounding the former officers' quarters adjacent to Gate 5. Trees here include 13 Maple along the wall fronting Chelsea Street, 5 Apple, 4 Horse Chestnut, 3 Linden, 1 American Elm, and 1 Spruce. Other vegetation in this area includes Forsythia, Rose, Lilac and Evergreen bushes. These trees and bushes lend a residential character to the Yard and serve as a backdrop to the neighboring buildings.

Vegetation throughout the remainder of the Shipyard includes numerous Maple seedlings and Tree of Heaven growing primarily against buildings. The Tree of Heaven in particular has an almost irrepressible capacity to adapt to the urban environment and can thrive growing from a crack in the paving or a building foundation. Various wild weeds and plants such as the Bulbous Buttercup, Dandelion, and White Clover also are found scattered throughout the area growing from spaces in the paving.

Wildlife in the project area is typical of an urban waterfront land habitat entirely occupied by man. Birds observed on the site include

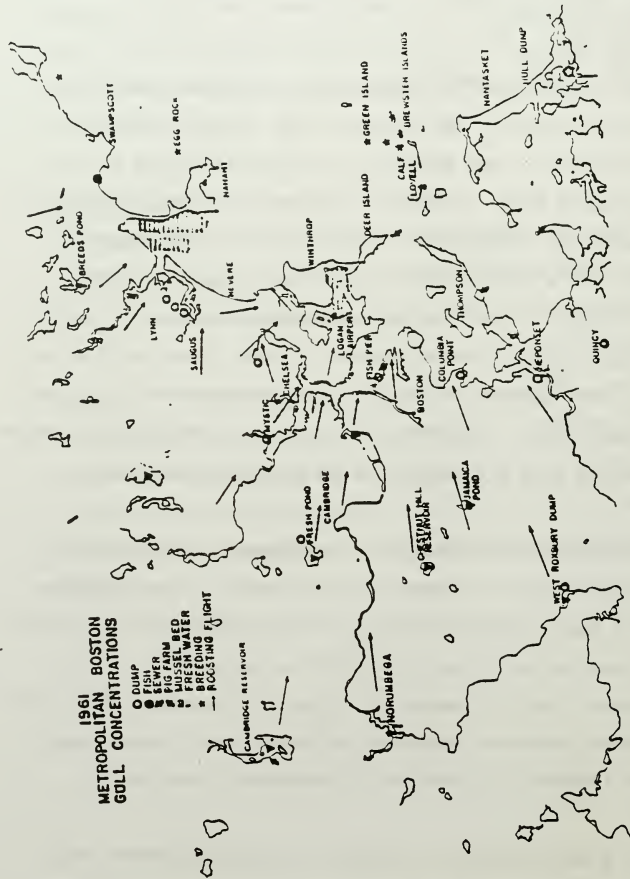


Figure IV.F.1: Metropolitan Boston Gull Concentrations and Roosting Flight Paths

the Black Backed Gull, Chimney Swift, Common Tern, English Sparrow, Herring Gull, House Wren, Robin, and Starling. Since the site is virtually totally developed, it is not utilized by waterfowl as a food or nesting resource. The site is, however, within the roosting flight path of the Herring Gull (see Figure IV.F.1). Other wildlife observed on-site include the Brown Bat, Gray Squirrel, House Mouse, and Rat.

No rare or endangered species of plants or animals are known to exist in the project area.

Marine Biology

The Shipyard is bounded by the Boston Inner Harbor to the south and east and by the Little Mystic Channel to the north. Marine life is essentially the same in the Harbor and Channel since the Harbor is the source of water to the Channel, and both water bodies are subject to the same external conditions. The ecosystem of the Inner Harbor is under tremendous physical and chemical stress from the urban and boating activities surrounding the area. The most damaging elements to the aquatic life are combined sewer overflows into the Harbor and the accumulation of chemical waste in the bottom sludge, as well as an accumulation of trash and debris on the marine floor. An additional factor contributing to poor conditions in the Little Mystic Channel is the inadequacy of flushing of the Channel and the resulting reduced dispersion of pollutants.

TABLE IV.F.1

PHYTOPLANKTON OF BOSTON HARBOR

Leptocylindrus danicus
Chaetoceros concavicornis
Chaetoceros coronatum
Chaetoceros decipiens
Nitzschia seriata
Coscinodiscus centralis
Rhizosolenia sp. (2) (alata)
Melosira moniliformis
Gyrosigma sp.
Pleurosira sp.
Navicula sp. (4-5)
Nitzschia closterium
Thalassiothrix frauenfeld
Fragilaria sp.
Biddulphia aurita
Thalassiosira nordenskioldii
Thalassiosira rotula
Thalassionema nitzschoides
Asterionella japonica
Skeletonema costatum

TABLE IV.F.2

PHYTOPLANKTON NUMBERS AT STATIONS ONE AND NINE¹

	<u>Coscinodiscus</u>		<u>Nitzschia</u>		<u>Chaetoceros</u>		<u>Skeletonema</u>		<u>Thalassiosira</u>	
	(1)	(9) Nos./ml	(1)	(9)	(1)	(9)	(1)	(9)	(1)	(9)
OCT.										
	0-10	--	25-30	--	0-7	0-6	--	--	--	--
NOV.										
	4-11	6-11	5-10	--	6-8	--	--	--	--	--
DEC.										
	60-70	7-32	n.d.	--	7-60	--	--	--	--	--
JAN.										
	50	--	n.d.	--	n.d.	--	--	--	--	--
FEB.										
	n.d.	--	n.d.	--	n.d.	--	--	--	--	--
MARCH										
	6	5	n.d.	--	0-40	6	--	--	--	--
APRIL										
	4-6	4	n.d.	--	40-119	11	100-5000	125-150	148	14
MAY										
	5	2	n.d.	--	0-115	--	120	140-180	--	--

¹ Station 1 located between Deer Island and Graves; Station 9 located off the U.S. Coast Guard Station (North End, Boston) in the Inner Harbor.

Source: New England Aquarium, Research Department, Water Quality Measurements of Boston Harbor, Boston, 1973, p. 41.

Table IV.F.3

Algae of the Harbor AreaA Partial List of the Most Common Algae Plants

<u>Latin Name</u>	<u>Common Name</u>	<u>Latin Name</u>	<u>Common Name</u>
Family XANTHOPHYCEAE	YELLOW-	<u>Fucus evanescens</u>	rock weed
BROWN ALGAE		<u>Fucus spiralis</u>	rock weed
<u>Vaucheria</u> species		<u>Fucus vesiculosus</u>	rock weed
Family CHLOROPHYCEAE	GREEN	<u>Laminaria agardhii</u>	kelp
ALGAE		<u>Laminaria digitata</u>	finger kelp
<u>Chaetomorpha linum</u>		<u>Laminaria saccharina</u>	kelp
<u>Enteromorpha erecta</u>	green con-	<u>Petalonia fasciata</u>	
	fetti	<u>Punctaria latifolia</u>	
<u>Enteromorpha intestinalis</u>		<u>Ralfsia rugiformis</u>	
<u>Enteromorpha linza</u>	green	<u>Scytosiphon lomentaria</u>	
	string	Family RHODOPHYCEAE	RED ALGAE
<u>Enteromorpha</u>	lettuce	<u>Chondria baileyana</u>	
<u>prolifera</u>	silk	<u>Chondrus crispus</u>	Irish moss
<u>Monostroma oxyspermum</u>	confetti	<u>Cystoclonium purpureum</u>	
<u>Rhizoclonium tortuosum</u>		<u>Dumontia incrassata</u>	
<u>Ulothrix flacca</u>		<u>Halosaccion species</u>	
<u>Ulva lactuca</u>	sea	<u>Hildenbrandia prototypus</u>	
	lettuce	<u>Lithothamnium lenormandi</u>	
<u>Urospora</u> sp.		<u>Lomentaria clavellosa</u>	
Family PHAEOPHYCEAE	BROWN	<u>Petrocelis middendorffii</u>	
ALGAE		<u>Phycondrys rubens</u>	
<u>Agarum cribrosum</u>	holed kelp	<u>Polysiphonia lanosa</u>	mermaid's
<u>Ascophyllum mackaii</u>	rock weed		hair
<u>Ascophyllum nodosum</u>	rock weed	<u>Porphyra umbilicalis</u>	red jabot
<u>Chorda filum</u>	devil's		laver
	shoelace	<u>Rodfymenia palmata</u>	red kale
<u>Fucus edentatus</u>	rock weed		

These are the most common algae identified in the Harbor area. The list obtained from the Boston Harbor Islands Comprehensive Plan was confirmed by field survey and local data.

Source: Envirovestment, Inc., Boston East - Final Environmental Impact Report, Cambridge, Feb. 1976, p.59.

The benthic community must thrive in a clayey silt overlain by coarse sand and organic sludge, much of which is petrochemical in origin. The major benthic species found in the area of the Inner Harbor are annelids, polychaetes, crustaceans, nemerteans and one species each of gastropod, pelecypod, hydrozoan, nematods, and pynogonid. None of these species or classes is unique to the Harbor, and they are not of significant commercial or scientific value. In the inter-tidal zone the predominant species is the mussel, which has reached only about one-third of its potential population level. Barnacles and soft-shell clams are the second dominant species. Both the barnacles and clams are underdeveloped in size and number due to the adverse benthic conditions. Soft-shell clams which normally are of commercial food value are not harvested here due to the high coliform count in the water.

Plankton are the floating life forms that inhabit the marine environment. Phytoplankton utilize both the basic nutrients and photosynthesis as their energy source. However, since the turbidity of the water is relatively high, growth of phytoplankton is limited to about the upper five meters. Since phytoplanktons are the first step in the food chain of the marine ecosystem, their lack of abundance may be interpreted as a partial cause of the relatively small population and diversity of species higher on the food chain. Phytoplankton in the Channel are more abundant, particularly during Spring bloom, due to the reduced dispersion of organic nutrients. The Channel, therefore, is somewhat more entrophic than the Inner Harbor. Zooplankton, which feed on the phytoplankton,

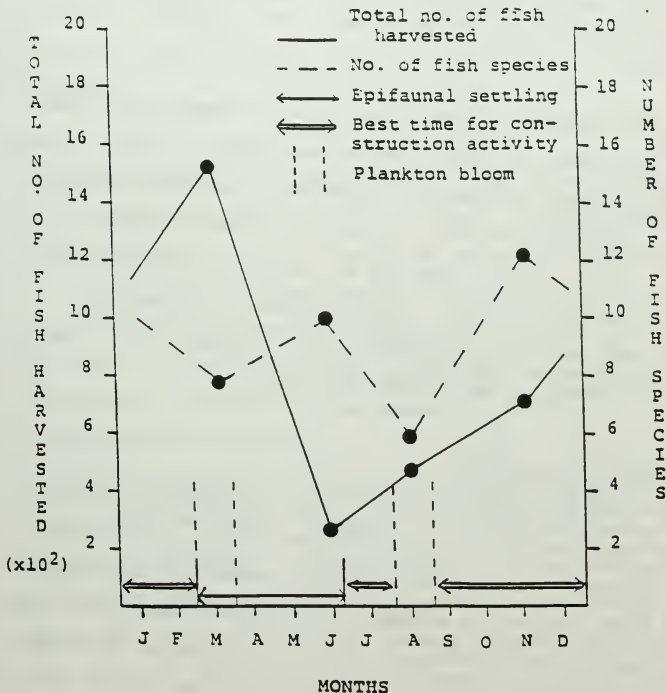
Table IV.F.1

Finfish in Little Mystic Channel

<u>Latin Name</u>	<u>Common Name</u>
<i>Alosa aestivalis</i>	Blueback herring
<i>Alosa pseudoharengus</i>	Alewife
<i>Anquilla rostrata</i>	American eel
<i>Brevoortia tyrannus</i>	Atlantic menhaden
<i>Clupea harengus</i>	Atlantic herring
<i>Fundulus heteroclitus</i>	Mummichog
<i>Fundulus majalis</i>	Banded killifish
<i>Gadus morhua</i>	Atlantic cod
<i>Macrozoarces americanus</i>	Ocean pout
<i>Menidia menidia</i>	Atlantic silversides
<i>Microgadus tomcod</i>	Tomcod
<i>Morone americana</i>	White perch
<i>Morone saxatilis</i>	Striped bass
<i>Myoxocephalus aeneus</i>	Grubby
<i>Osmerus mordax</i>	Rainbow Smelt
<i>Pollachius virens</i>	Pollack
<i>Pomatomus saltatrix</i>	Bluefish
<i>Pseudopleuronectes americanus</i>	Winter flounder
<i>Scomber scombrus</i>	Mackerel
<i>Tautoglabrus adspersus</i>	Tautog
<i>Urophycis chus</i>	Red hake

Figure IV.F.2

SEASONAL BIOLOGICAL ACTIVITY IN THE INNER HARBOR



Source: Envirovestment, Inc., Boston East-Draft Environmental Impact Report, Cambridge, August, 1974, p. III-23. (after R. L. and S. O. Haedrich, "A Seasonal Survey of the Fishes in the Mystic River, a Polluted Estuary in Downtown Boston, Massachusetts", Estuarine and Coastal Marine Science (1974), 2, 59-73.)

are the food source for free-swimming fish. The Zooplankton population also is low, implying that the Inner Harbor cannot support abundant fish breeding.

Approximately twenty-one species of finfish can be expected to be found in the Inner Harbor and Channel. The dominant species are winter flounder, which can be found year-round, and rainbow smelt, found during the early Spring. Herring are prevalent in the Spring and alewife in the early Summer. Fish in the Inner Harbor are not commercially harvested due to the poor quality of the water. Relative to other fish communities living under more favorable conditions, the fish community of the Inner Harbor and Channel is less abundant and diverse.

2. Impact of the Project

The proposed development of the Navy Yard is not expected to have any significant adverse impact on the terrestrial biology. Existing trees and landscaping will be preserved insofar as possible in the redevelopment of the Yard; and new vegetation, in the form of trees, grass areas, and plantings, will be provided as part of the new housing development. Considerable vegetation also will be added to the area with the construction of the harborside park, which will include several varieties of deciduous and flowering trees and conifers, shrubs and bushes, extensive grassed areas, and a botanical garden area containing plants common to a seaside location. These proposed plantings will beneficially impact the urban ecology by introducing additional natural elements into an environment that is basically man-made.

The small anticipated changes in noise levels and air quality are not expected to have any effect on the survival of existing or future flora and fauna in the project area. Since no sensitive natural ecosystems are known to exist on the site, none will be destroyed by the proposed development.

The proposed project also is not expected to result in any significant adverse long-term impacts on the marine biology. Temporary negative impact on aquatic life will be generated by the removal of and driving of piles for the construction of the marinas and waterfront housing and by the introduction of increased suspended solids into the water column resulting from these activities and the stirring of bottom sediment. Approximately 3,833 piles are to be removed and 5,700 new piles are to be driven for the construction of marina facilities. This activity will temporarily disrupt the benthic community by shifting the shellfish beds, but it is not expected to result in any significant damages or alteration to the benthic community or reduction of its population. The disruption of bottom sediment will be temporary, and the existing benthic population is low and of no important commercial or food value. After the initial disruption of bottom sediment, the shellfish beds can be reestablished, and the wooden pilings will provide surfaces for barnacles and similar organisms to affix. No dredging is expected to be necessary for the construction of the marina facilities.

Increased turbidity from suspended solids may result in impairment to respiration by fish species in the project area and in a reduction in the amount of light filtered to plant life for photosynthesis. However, due to the low diversity and low density of the aquatic population and the temporary period of effect and limited area of impact, no significant damage to aquatic life is expected from this project.

3. Impact of Alternatives

(1) "No-Build"

Under a "no-build" alternative, there will be no physical removal or alteration of vegetation or wildlife habitat or the marine environment. With the lack of proper maintenance, however, the existing vegetation could be expected to revert to a semi-wild state, and there would be an increased growth of weed species and of animal and bird life. The marine biology would continue to be adversely affected by land-based pollution from run-off and sewer outfalls.

(2) Alternative Development Options

Impacts on the land ecology would not differ appreciably from the proposed development, except that lesser amounts of new vegetative resources would be provided under the alternative options; little if any new vegetation would be added by the industrial/institutional option.

However, the increased industrial activity under these two options could adversely affect existing floral and faunal resources through increased air and noise impacts, especially if heavy industry were included.

The impacts on the marine biology under the alternative proposals would be similar to those of the proposed development, differing only in degree. Disruption of the benthic environment would be proportionally less where fewer pilings would be removed and driven for marina facilities, and less turbidity would result from proposals involving a smaller degree of pier demolition and new construction. However, under the proposal involving a greater concentration of industrial activity, turbidity would probably be greater since there would be less landscaped area to inhibit run-off into the Harbor. Ship operations also would cause occasional increases in turbidity.

(3) Shipyard Reuse

Total development of the site for shipyard use would tend to have a more adverse impact on existing plant and animal life from increased noise levels and air pollution and related industrial activity, although it should be noted that most of the vegetative resources are located near the western edge of the site and thus are physically removed from the more intense shipyard uses and

that this vegetation did exist for a considerable length of time when the Yard previously was operated as a shipbuilding and repair facility. Animal and bird life would be more severely impacted. The marine environment especially would be adversely affected by the shipbuilding activities, including increased water pollution levels and greater turbidity.

IV.G. OPEN SPACE AND RECREATION

1. Existing Recreation Facilities

The pedestrian and public open space network of the Charlestown Navy Yard development is designed to be an extension of the existing recreational facilities in the Charlestown community, a part of a planned link to downtown Boston via the new Charles River Dam and the Paul Revere Landing Park, and a complement to the plans for the USS Constitution National Historic Park. Major elements of the open space and recreation plan include: (1) a public park and marina, (2) public easements and promenade along the water's edge, and (3) streets and small parks throughout the Shipyard designed to encourage strolling and sitting.

At the present time, Charlestown has a total of 22 acres of playgrounds and 6 acres of public parks (see Appendix G) to serve a population of some 17,000 persons. Although bordered on two of its three sides by water, the community has very little waterfront area that they can call their own. With the exception of a softball diamond and other athletic facilities on the western edge of the town, which is separated from the residential section, and the Barry Playground and the Charlestown High School physical education facilities, both of which are located on the Little Mystic Channel, most of Charlestown's waterfront is taken up by industrial and transportation uses and by the Shipyard.

Two new parks are planned to be developed outside the project area. One is the 22 acre USS Constitution National Historic Park in the oldest part of the Navy Yard, to be developed and operated by the National Park Service. Besides the USS Constitution, the oldest commissioned warship

in the world and the flagship of the First U.S. Naval District, the park will contain a museum and information displays on the Constitution, the Boston Naval Shipyard, and life in the U.S. Navy over the years. The second new park, designed to mark the landing spot of Paul Revere in Charlestown at the start of his famous ride, is being constructed by the Metropolitan District Commission (MDC) in conjunction with the new Charles River Dam. The park will consist of a sitting area for viewing the dam and will serve as a pedestrian entrance to Charlestown.

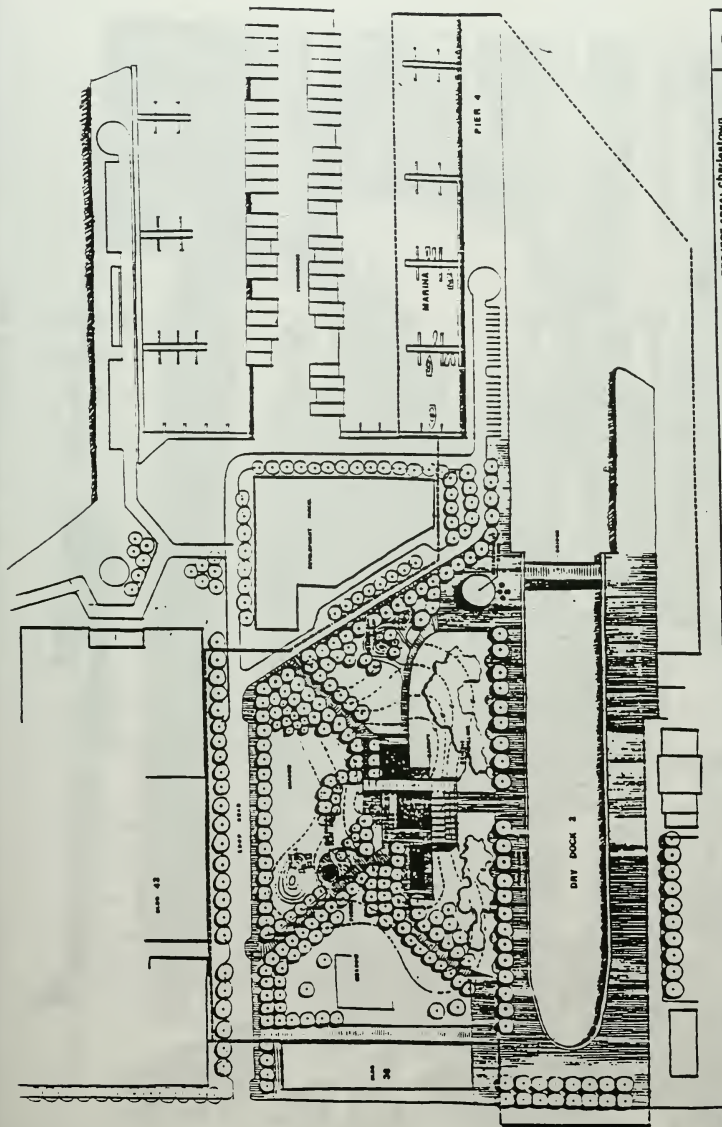
2. Description of Proposed Open Space and Recreation Facilities

(1) Public Park

The proposed public waterfront park is located in the center of the Shipyard, contiguous to the National Historic Park, the Historic Monument Area, the New Development Area and the main channel of the Boston Inner Harbor. The Park will contain approximately 17 acres of land, drydock, piers and water. Building 195, which occupies a portion of the site, will be demolished; and the Pump House, Dry Dock No. 2, and Pier 4 will be retained and reused.

The Park Concept and Program

The park is expected to become an integral part of the daily life of the new Shipyard residents, visitors, and the Charlestown community. The programming and design of the park have been developed to provide pleasure in the outdoors with a variety of both passive and active recreational facilities for families, young adults, the elderly and the handicapped. At the same time, the park will promote knowledge of and



PROJ. AREA: Charlestown
 DATE: 1/80
 SCALE: 1" = 100'

URBAN DESIGN DEPARTMENT



Boston Naval Shipyard Park

BOSTON REDEVELOPMENT AUTHORITY

Figure IV.6.1

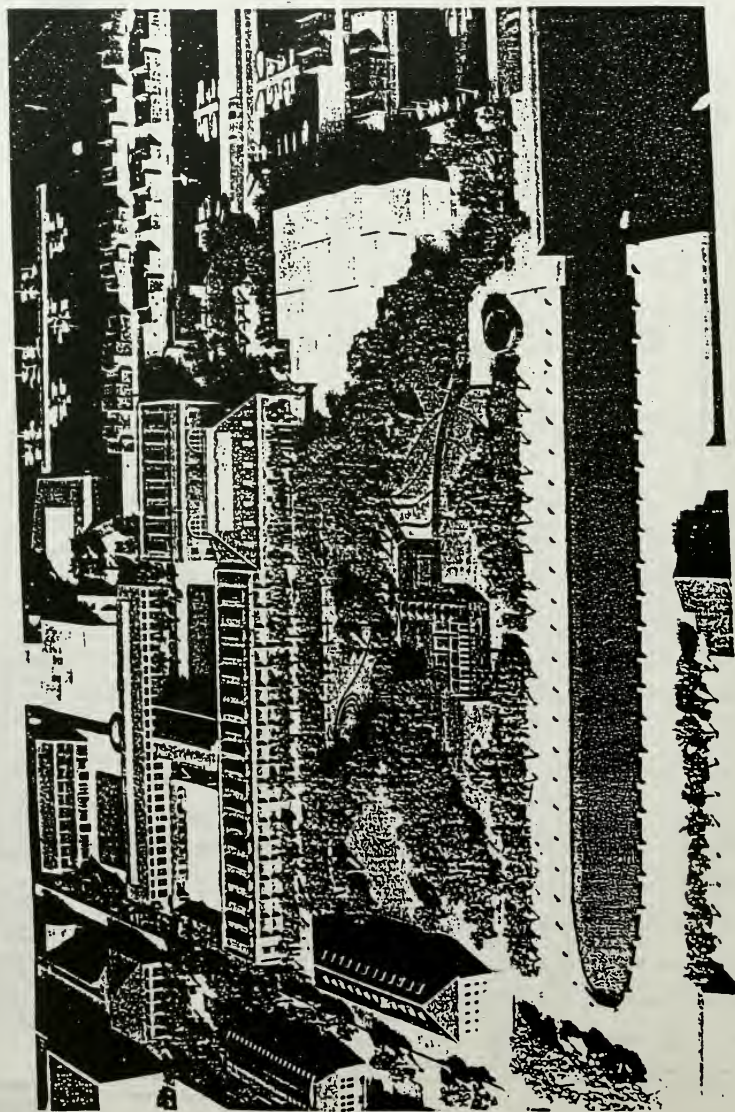


Figure IV.G.2: Aerial View of Model of Proposed Waterfront Park - Charlestown Navy Yard

interest in the sea, nature, and history, and provide relief from Boston's busy urban environment. A maritime character, appreciation of water, creation of scenic views, and development of informal recreational facilities are the predominant considerations in the park concept.

The Dry Dock

Dry Dock No. 2, which will be rehabilitated and flooded, and the Promenade around it, are the most prominent historic and scenic elements of the park. Boston Harbor will be first seen and experienced here by the visitors arriving to the park from Gate #4. One will be able to stroll down the tree-lined Promenade toward the marina, enjoy the dramatic views of the downtown skyline, rest on benches adjacent to the water, and examine the Dry Dock's maritime artifacts such as capstans and bollards.

The Pump House at the end of the Dry Dock will be rehabilitated and used as a refreshment stand with sitting areas around it.

Landscaped Area

On the east side of the Promenade will be a landscaped area which will be used for a variety of recreational activities. Since the surrounding buildings shelter the park from prevailing off-shore breezes, the park will be a pleasant place to walk, rest, and play during the entire year.

A focus of the area will be the Fountain Plaza, which will include an Exhibit Pavillion and a large illuminated body of water. This two-leveled, paved, and formally landscaped space will be the highest point of the park, offering dramatic views of Boston Harbor and the downtown skyline. The ground will slope gently from the Plaza toward the Promenade and surrounding buildings. The slopes will be created to enhance the water views, physically separate different park activities, and provide visual diversity within the park.

The water feature on the Plaza will consist of three interconnected pools of water and an illuminated fountain in front of the Pavillion. Water from the pool on the upper plaza level will cascade into the fountain and finally to another pool on the lower plaza level. This area will serve as a model-boat sailing pool. The pools and the fountain will be surrounded by benches, flower beds, and trees.

The Exhibit Pavillion can be entered from the lower plaza level near the fountain and/or from the Dry Dock Promenade. It will feature an historic exhibit about the Shipyard and will include a model of the Dry Dock. Visitors will be able to circulate from the Fountain Plaza through the exhibit space to the Promenade.

Three outside walls of an existing historic building will be retained and the space within covered by light-weight roof structure. The roof will extend into a canopy across the upper plaza level.

The Children's Play Area

The Children's Play Area is situated to the north of the Fountain Plaza and will include a paved space with spray fountain and sandbox and a nearby play hill. The paved area will be surrounded and physically separated from the major walkway by a low sitting wall. The play hill could be used for sliding in winter.

Meadows along the western and northern edge of the park are designed to be used by visitors for informal ball playing, frisbee throwing, and kite flying. Tree groves that surround the meadows can be used for picnics.

A small botanical garden located in the southern part of the park will provide both educational and recreational features for all park visitors. Carefully selected native New England plant species will be represented and described by appropriate botanical name tags. Clusters of trees within the area will provide shady resting points.

Marina

A marina for 50 boats will be built adjacent to Pier 4. Although the marina will be operated by concession, the pier will remain open to the public. An agreement with the concessionaire will include a condition that the operator of the marina charge reasonable fees and make slips available on a first come/first serve basis. No membership or other joining fees will be permitted.

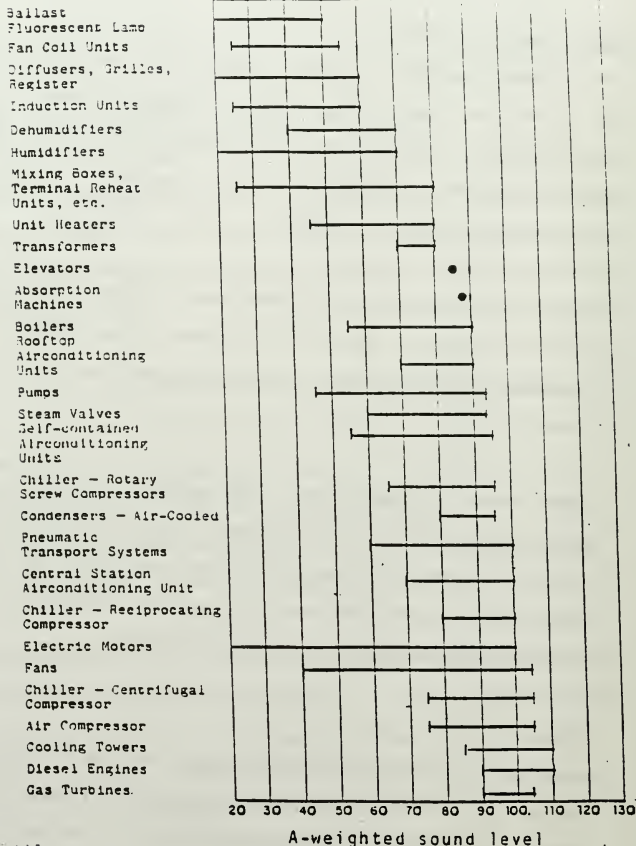


FIG.IV.I.5: RANGE OF SOUND LEVELS IN dB(A) TYPICAL FOR BUILDING EQUIPMENT AT 3 FT.¹

¹ U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances (NTID 300.1), Dec. 31

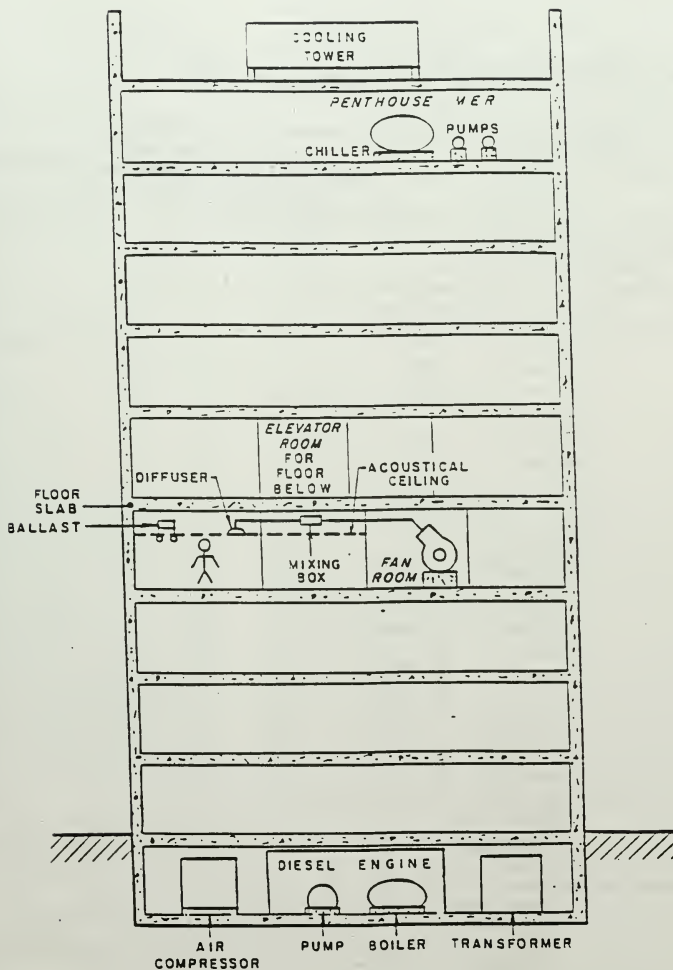


FIG. IV. I. 6: CROSS-SECTION OF A TYPICAL MULTISTORY BUILDING SHOW-
ING BUILDING EQUIPMENT.¹

¹ U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations. Building Equipment, and Home Appliances (NTID 300.1), Dec. 31, 1971.

TABLE IV.1.1: EXPOSURE OF BUILDING OCCUPANTS TO THE
NOISE OF BUILDING EQUIPMENT¹

Building Equipment	Location	Type of Exposure		
		Direct	Indirect	
			Through Mechanical Distribution System	Through Walls, Floors, etc.
Air Conditioning				
	MER*		x	x
	Roof. Unit		x	x
	Wind. Unit	x		
Absorption Machines	MER			x
Air Compressor	MER			x
Ballasts	Room	x		
Boilers	MER			x
Boiler Feed System	MER			x
Chillers	MER			x
Condensers	Rooftop			x
Cooling Towers	Rooftop			x
Dehumidifiers	MER		x	x
Diesel Eng.	MER			x
Diffusers	Room	x		
Electric Motors	MER			x
Elevators	Varies	x	x	x
Escalators	Varies	x	x	x
Fans	MER		x	x
	Room	x		
Furnaces	MER			x
Gas Turbines	MER			x
Heat Pumps	MER			x
Humidifiers	MER		x	x
Mixing Boxes and Air Control Units	Varies	x	x	
Pneumatic Transporter System	Varies		x	x
Pumps	MER			x
Steam Valves	MER			x
Transformers	MER			x
Unit Vent and Unit Heat	Room	x		

*Mechanical Equipment Room

¹ U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances (NTID 300.1), Dec. 31, 1971.

A-WEIGHTED SOUND LEVEL

30 40 50 60 70 80 90 100 110 120

LAMP BALLASTS
AND VAPOR

DIFFUSERS

MIXING BOXES

FAN COIL

TRANSFORMERS

PUMPS

BOILERS

STEAM VALVES

CHILLERS

ELEVATORS

AIR COMPRESSORS

COOLING TOWERS

FANS

DIESEL EMERGENCY
GENERATOR

W - INTERVENING WALL
D - DUCT TREATMENT
E - ENCLOSURE OF EQUIP
R - INTERVENING ROOF
STRUCTURE
S - BUFFER ZONE FLOOR
BETWEEN SOURCE AND
OCCUPANT'S FLOOR
V - VIBRATION ISOLATION
OF EQUIPMENT

- SOUND LEVEL AT 3 FT FROM SOURCE
- SOUND LEVEL AT OCCUPANT'S POSITION

FIG. IV.1.7: RANGE OF BUILDING EQUIPMENT NOISE LEVELS TO WHICH PEOPLE ARE EXPOSED.¹

¹ U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations. Building Equipment, and Home Appliances (NTID 300.1), Dec. 31, 1971.

place, at a relatively continuous level. Such potential noise sources could include intake and exhaust louvres, discharge stacks, air conditioners, cooling towers and similar equipment. In several of these, the actual noise generated is somewhat removed from the "noise location", such as a fan placed behind a louver. Typical sound level ranges and exposure for various types of building equipment systems are indicated in Figures IV.I.5 to IV.I.7 and Table IV.I.4.

Since detailed building designs are not available, the actual extent of noise impact from building equipment cannot be estimated at the present time. However, it is expected that the design of such systems will meet or exceed applicable noise level criteria and that noise levels will be as low as current available technology allows for the benefit of future residents and the community.

Proposed industrial uses also may produce new noise sources. However, any impact is not anticipated to be significant since the type of industry envisioned will be light industry, rather than heavy, and noises will be contained primarily within the buildings. In addition, the industrial area is located adjacent to the Tobin Bridge corridor, where noise levels are already high.

Other principal noise sources within the development area include the marina and parking areas. Outboard motors are quite noisy, although efforts are being made to reduce their noise levels, and typical levels are estimated at about 95 dB(A). Since in a free field sound intensity

decreases by 6 dB with every doubling of distance, the distance at which this source would drop to the level of normal conversation (65 dB(A)) is approximately 1,500 feet. Typical levels reached within parking areas are estimated at 80 dB(A), which would be reduced to 65 dB(A) at 250 feet. The presence of buildings, however, would tend to reduce these distances due to their barrier effect.

7. Impacts of Alternatives

(1) "No-Build"

Under a "no-build" alternative, noise levels would remain essentially the same as at present and the environment would be impacted only by factors unrelated to the Navy Yard. Principal noise sources would be trucks entering and leaving the Yard and would be intermittent. Since there would be no new development or rehabilitation under this alternative, construction-related noises would not occur.

(2) Alternative Development Options

Construction-related noise impacts would be essentially the same as the proposed development project, as would the impacts from building mechanical systems. However, the magnitude of the impacts would be somewhat reduced, since less demolition and less new construction was proposed in the alternative schemes. Traffic related noise impacts also would be somewhat less, since it is estimated that traffic generated by the alternate schemes would be from 56% to 74% of that of the proposed development. However, under both alternatives,

truck traffic would be increased because of greater industrial development.

Land use related impacts under the housing/industrial/institutional option would differ only slightly, whereas higher levels could be anticipated from the industrial/institutional option due to increased industrial use, including heavy industry, increased truck traffic, and possible rail usage. Also, the existing power plant would be retained to provide power for the industries. Since no residential or related uses were contemplated under this option, requiring low ambient noise levels at night, unusual noise reduction on fixed equipment within the Yard, other than the power plant, would not be necessary.

(3) Shipyard Reuse

Since this alternative proposed total reuse of existing structures rather than partial demolition and new construction, short-term noise impacts would be minimal. In the long-term, the type of activity proposed would increase significantly ambient noise levels within the Yard and could adversely impact adjacent residential areas and the adjoining National Park. Although vehicular traffic would be considerably less than the proposed project, the volume of truck traffic would be increased, resulting in generally high traffic noise levels.

IV.J. ARCHAEOLOGY/HISTORY

1. Archaeological Resources

According to the State Archaeologist, Mr. Maurice Robbins, there are no known archaeological sites within the Charlestown Naval Shipyard (see Appendix J.1).

2. Historic Structures

The Charlestown Navy Yard is a National Historic Landmark and is listed in the National Register of Historic Places. It is significant in a number of contexts, including:

- (1) the Revolutionary War era and the subsequent establishment of the U.S. Navy;
- (2) the building and maintaining of naval ships during each of the major wars in which this country has engaged;
- (3) the development of industrial technology related to shipbuilding;
and
- (4) architectural history and urban design, in particular the evolution of a style known as Boston's granite architecture.

The Shipyard is also renowned as the location of the oldest commissioned ship in the U.S. Navy - the USS Constitution.

Several structures of historic importance are found within the Shipyard, dating from the beginning of the 19th century to the Second World War era. Table IV.J.1 gives a summary description of these buildings. The



More than any other portrayal of the Yard, this delicate pencil drawing shows why Joshua Humphreys recommended this site: a well-protected harbor, deep enough for the 74s building and for future warships, and safe from "winds, freshets, and enemy." Plenty of sea-minded manpower was available in nearby Boston—the tangle of masts and exaggerated steeples at center right. East Boston forms the other half of the neck into the inner harbor. This drawing, done in 1837 from the yet incomplete Bunker Hill Monument, was possibly drawn by R. P. Mallory, whose later panoramic view from the monument was reproduced in several books. (Courtesy Boston Athenæum)

Figure IV.J.1: Charlestown Navy Yard - Panoramic View from Bunker Hill Monument, 1837
(drawing by R.P. Mallory)

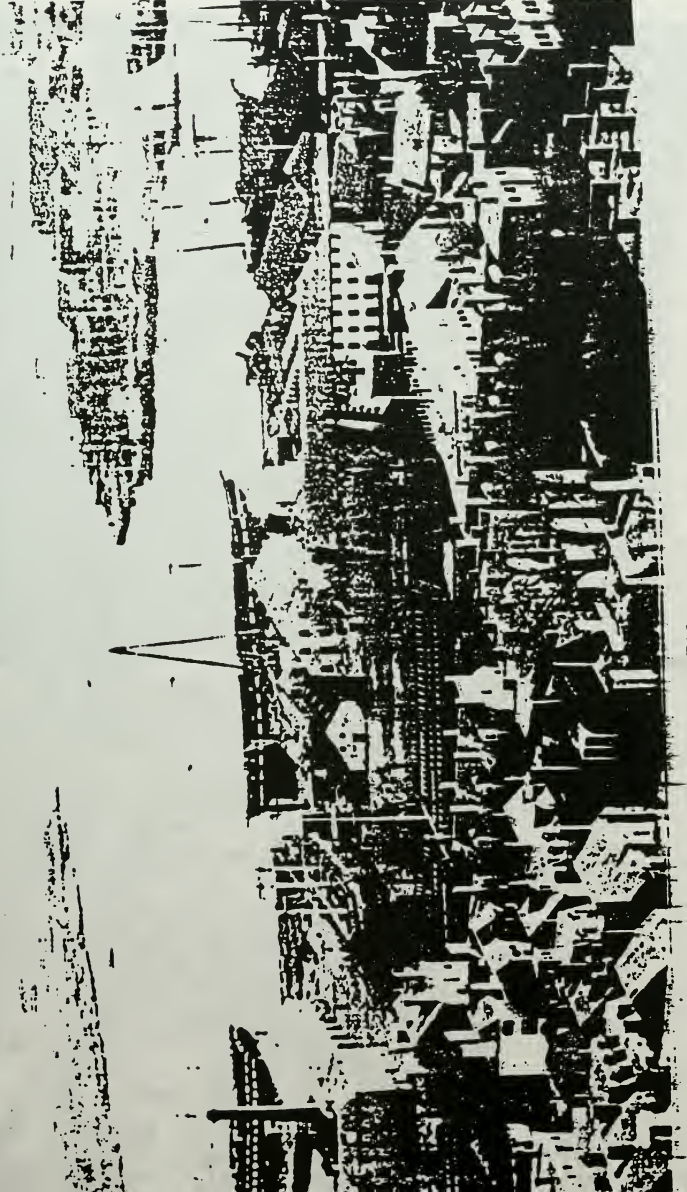
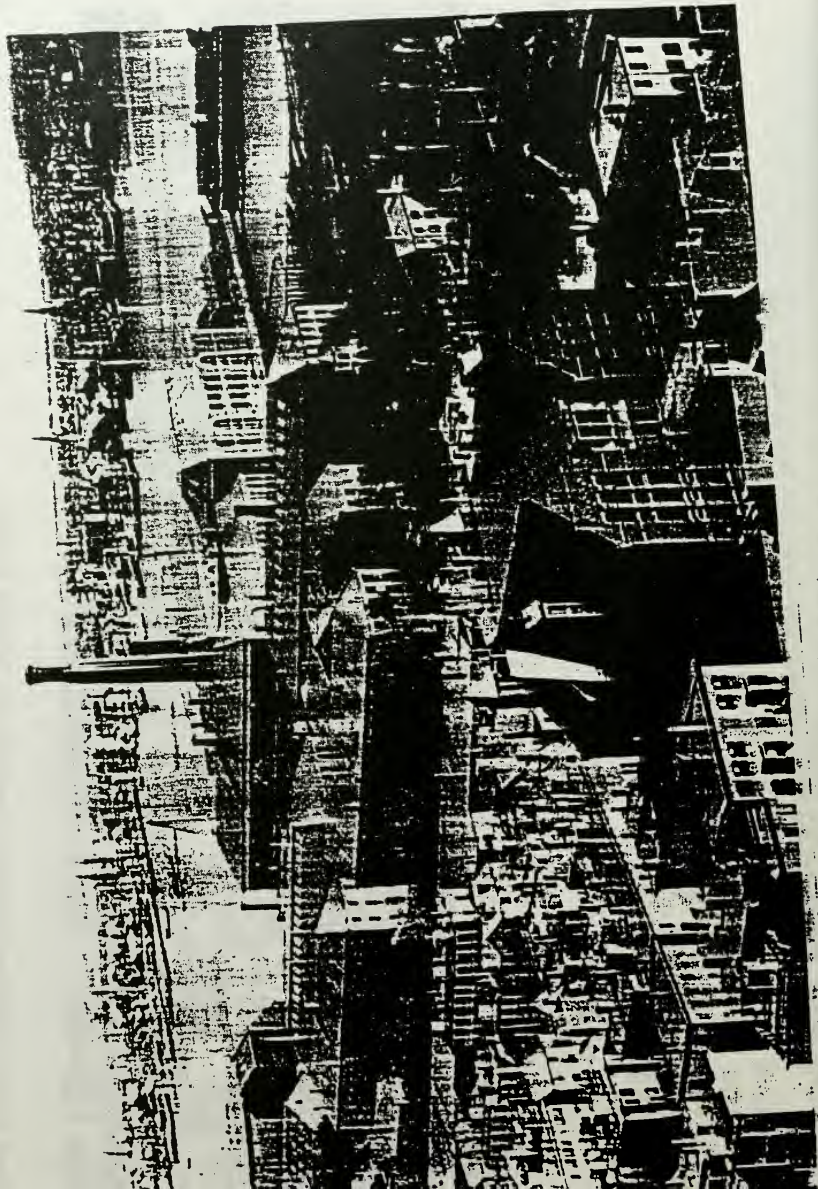


Figure IV.J.2: Charlestown Navy Yard - Panoramic View (Mid-19th Century)



Panoramic View (after 1860)

Table IV.J.1: Historically and Architecturally Significant Buildings
within the Charlestown Navy Yard⁴

Ropewalk Complex

#58 - Ropewalk (1834-36)

The Rope Walk is a unique granite structure running 1360 feet and responsible for producing all Navy rope for 135 years. It was originally one story; in 1865 a second story was constructed. The only surviving stone ropewalk in the nation, it was designed by Alexander Parris.

#60 - Tarring House (1838)

Built of granite, hemp was tarred in building 60 before it was woven in the Rope Walk. Probably designed by Parris.

#62 - Hemp House (1837)

Originally a storage house for hemp, building 62 "reconciles the diverging axis of the Rope Walk and the predominant grid pattern in the Yard." Probably designed by Alexander Parris.

Granite Storehouses and Shops

#34 - Storehouse/Laboratory Building (1837)

A three story granite building, this was the first to be built along the longitudinal axis of the yard. It was designed by Parris.

#33 - Storehouse and Sail Loft/Barracks and Mess (1850)

A storehouse and sail loft originally, building 33 is distinguished from similar buildings particularly by light-dark granite patterns on the exterior.

#38 - Packing House and Cooperage (1854)

This structure has accommodated a variety of uses, presently containing a theatre, library and bowling alley. It is essentially identical to building 33 with some color variation.

#36 - Joiner's Shop and Painter's Loft (1866)

With the same massing and axis of building 33 and 38, building 36 has especially prominent entrances and displays fine granite workmanship. The interior was completely rebuilt in 1936.

#75 - Timber Shed (1848)

The only remaining timber storehouse from the last century, it is an outstanding example of 19th century craftsmanship in wood and granite. Some of the detail is Greek Revival in style.

Brick Sheds

#42 - Machine Shop (1856-54)

The earliest heavy machine shop in the yard, the original U shape of building 42 was modified to complete it on its open, waterfront end.

#96 - Boiler House for Ropewalk/Hemp Storage (1899)

Originally a boiler (power) house for the Ropewalk, this building was later converted to a storehouse. It is a tall, one-story structure, open on the interior, with attractive brick detailing on the exterior.

#108 - Power Plant (1904)

A tall, two-storied concrete and steel structure with a brick exterior, the power plant was designed in concert with building 107, to which it is joined. However, its northeast and northern sections encompass the stacks and irregular massing of the plant.

#106 - Boiler Shop (1901-05)

Similar to buildings 105, 193, and 104, the boiler shop is the most intact of this group and has retained its one-story side bays and original clerestory.

#107 - Maintenance Shop (1904)

This two-story oblong brick building with restrained Neoclassical elements maintains the shape of earlier buildings and the alignment of the grid pattern.

#105 - Forge and Foundry (1905)

A loft structure of brick, it is in an Neo-classical revival style, located on the site of Moulton's Point where the British landed before the Battle of Bunker Hill and is where the "die-lock" chain was invented.

#114 - Carpenter Shop (1905)

A light, large, and open building, it is decorated by giant arched windows and decorative brickwork in the manner of late 19th century industrial buildings.

Concrete Warehouses

#149 - General Warehouse (1919)

This building is a ten-story reinforced concrete frame structure with curtain walls of brick and glass and a dramatic light court in the southwest half of the building.

#199 - Warehouse (1942)

Similar to building 149 in style, this warehouse also is a steel and concrete frame structure of nine stories with brick and glass curtain walls.

Other Buildings

#266 - Officers Quarters (1825-26)

Four brick houses, three stories high, the buildings were remodeled several times with porches and roofs of different eras than the original structures.

#31 - Muster House/Telephone Exchange (1852)

A three-story, brick, hexagonal tower, the Telephone Exchange is the only structure with a "verticle emphasis" in the Naval Yard. Its unusual form is indicative of decorative Victorian architecture in the middle years of the 19th century.

#79 - Boiler House and Coal Shed for Ropewalk (1852, 1858-59)

Built of brick with granite trim and a corbelled brick cornice, this building repeats the basic templar scheme of the Ropewalk.

#39 - Ordinance Store/Administration (1863)

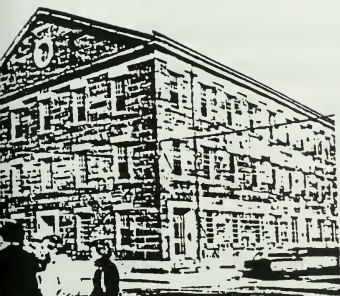
A three-story brick building with granite trimmings, it was converted from an ordinance shop to offices. There have been additions and the building appears to have structural problems.

#120 - Dispensary and Dental Clinic (1905)

This is basically a two-story brick building with single story wings in the Georgian Revival style and similar later additions. Quoins, flared lintels, and ground floor rustication are distinguishing stylistic features.

#200 - Fire Station (1941)

This is a utilitarian three-story steel, concrete, and brick structure with a flat roof which maintains building shape and alignment of its earlier granite neighbors.



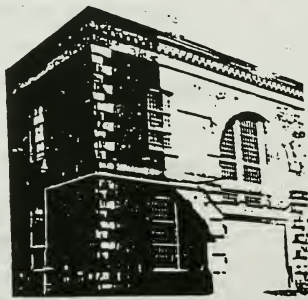
Building 33



Building 58 (Rope Walk)



Dock 2



Building 42



Building 38



Building 34

Figure IV.J.4: Charlestown Navy Shipyard - Buildings of Historical and Architectural Merit

significance and characteristics of the Shipyard are further described in greater detail in a preliminary report on the history and architecture of the site, which is found in Appendix J.2.

3. Impact of the Project

Objectives and Philosophy

The Boston Redevelopment Authority's dual objectives for the treatment of the Shipyard are to maximize conservation of the historic and architectural character of the site while at the same time maximizing the reuse potential of the buildings for economically viable purposes.

Changes will occur in the Shipyard. The function which created the character of the site no longer exists and cannot be duplicated. In order for the resources to remain, it must be adapted to new uses. The task is to retain as much as possible of the form, character, and "flavor" of the Shipyard while equipping it for a new and useful life.

In its physical treatment of the Shipyard it is the intent of the Boston Redevelopment Authority to neither re-create the impression of an earlier time period nor to expunge all evidence of the area's industrial past. Rather, the Authority will look to the origins and significance of the Shipyard to determine what existing elements should be retained and to seek, as appropriate, precedents for solutions to contemporary design problems associated with economic revitalization of the site. The Authority will be primarily concerned with three areas of the Shipyard's significance:

- (1) its associations with the technology and craft of shipbuilding;
- (2) its notable architecture - in particular, its examples of Boston's granite architecture; and
- (3) its identity as a coherent urban environment, unified by a planning and architectural system and industrial accoutrement.

Other aspects of the significance of the Shipyard will be the subject of interpretation under the auspices of the National Park Service, the Department of Defense, and private, non-profit organizations.

The three areas of significance will be reflected in the physical treatment of site in the following ways:

- (1) structures such as the Ropewalk complex and the Forge and Foundry which were of particular importance to technological aspects of shipbuilding will be preserved;
- (2) notable buildings, particularly those representing the Boston granite style, will be rehabilitated in such a way as to reveal their inherent architectural quality and eliminate inappropriate, expedient later additions of a lesser quality;
- (3) lesser buildings which play an important and supportive role in the urban form of the Shipyard also will be rehabilitated with somewhat less stringent requirements, and some elements such as rail and crane tracks representative of the Shipyard's industrial character and image will be retained and whenever possible integrated with new public improvements; and

- (4) new additions or other construction will be totally contemporary but will respect the scale, massing, and other salient features of the basic urban design framework of the Shipyard.

General Guidelines

General guidelines for the treatment of buildings and their environment have been developed which attempt to satisfy the dual objectives for the Shipyard of preservation and economic revitalization. These guidelines have been prepared to be consistent with the "Basic Guidelines for the Rehabilitation of Historic Property" prepared by the Office of Archaeology and Historic Preservation of the National Park Service. They pertain to the design approach to the property and treatment of masonry, roofs, windows, and doors. They also provide criteria for evaluating what later additions and alterations to historic property may be removed or otherwise eliminated. The General Guidelines will serve as the basic framework for future decisions. During the planning and development process, they will be refined and revised as necessary to respond to increased understanding both of the historic and architectural character of the Shipyard and the realities of current market and economic conditions, resulting from further survey and research (see Appendix J.3).

Specific Design Standards

In order to obtain additional information as to the current state of buildings and other structures and the way that they and the entire Shipyard have evolved over time, systematic field observation has been

carried out and a thorough survey and analysis of plans, drawings, and photographs on file at the Shipyard undertaken. A chronological record of interior and exterior changes which have occurred to each building will be prepared from this material.

Following the completion of field survey, documentary research, and economic analysis, the synthesized results of these processes will form the basis for the specific design standards that will be developed for each building or group of buildings and for the treatment of the ground-plane or "exterior environment." The standard will be cognizant of the fact that the Shipyard is a National Historic Landmark. They will establish:

- (1) the specific elements of each building to be retained, replaced, removed, or repaired (both exterior and, as appropriate, interior);
- (2) specifications for the appearance and materials used in replacement, repair, or restoration; and
- (3) definitive controls for new construction including the massing and location of new buildings, the scale and articulation of facades, street containment, and the retention of vistas.

Design guidelines for the exterior environment, including streets and sidewalks, landscaping, lighting, and sign control will:

- (1) define materials and details for the design of streets, sidewalks, and other pedestrian areas;
- (2) locate and specify landscaping elements;
- (3) specify the location and type of lighting equipment and other street furniture to be used; and
- (4) identify and incorporate those items of landscaping, equipment, etc., to be preserved.

Administration of Design Controls

Prior to transfer of the Historic Monument Transfer Area, the specific design standards for each building and for public improvements in this section of the Yard will be submitted to the Office of Archaeology and Historic Preservation (OAHP) of the National Park Service for review.

These standards will become part of the Authority's "Program of Preservation and Utilization" for the Historic Monument Transfer Area. The Authority, in making application for transfer under the provisions of Section 203(k)(3) of the Federal Property and Administrative Services Act of 1949, as amended, will agree to use the property in perpetuity in accordance with the "Program." Under terms of the transfer agreement, the OAHP will continually monitor redevelopment activities in this area to ensure consistency with the design standards and controls.

In the event of noncompliance, the property would revert to the United States at its option.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, and in accordance with the procedures of the National Advisory Council on Historic Preservation, a Memorandum of Agreement will be executed between the BRA, the Advisory Council, the Massachusetts State Historic Preservation Officer, and the Bureau of Outdoor Recreation, Department of the Interior, prior to transfer of the park and recreation area to the BRA. This Memorandum will set forth the preservation obligations of the Authority in the development of the park facilities and will specify a review process with the State Historic Preservation Officer. A draft of this Memorandum is attached as Appendix J.4.

A similar arrangement is contemplated for the remainder of the site (the area to be purchased from the Federal government). A Memorandum of Agreement will set forth procedures for review by the Advisory Council and the Historic Preservation Officer of the design development phase of the proposed redevelopment activities to insure compatibility, in scale and material, of any modifications or new construction with the historic character of the area.

The specific design standards will be implemented through the urban design process of the Boston Redevelopment Authority. They will first be incorporated into developer's kits for each building. Working drawings, certified as being consistent with the design standards, will be incorporated into disposition agreements with developers.

Overall Preservation Approach

Based on the architectural/historical information now at hand, and the general guidelines which have been prepared, a preliminary proposal for the overall approach to exterior and interior treatment to be adopted for each of the buildings in the Shipyard is described below. This proposal is subject to modification based on additional information obtained from the survey of the buildings and more detailed planning for the site.

In summary, the preliminary proposal calls for four approaches to buildings, as follows:

- (1) Preservation: Treatment of four buildings in the Shipyard could be characterized overall as "preservation." These buildings, as a whole, will be retained in essentially their present form. Selective restoration of exterior and interior elements will be carried out and minor adaptations will be permitted. The purpose of the approach is to express the appearance and character of these buildings and the industrial functions which were carried out within them.

Buildings included in this category are: 58 (Ropewalk), 60 (Tarring House), 62 (Hemp House and later Test Lab) and 105 (Forge and Chain Shop).

- (2) Rehabilitation: Most of the buildings in the Shipyard are in the category of "rehabilitation," defined as "the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use" (from "Basic Guidelines for the Rehabilitation of Historic Property," National Park Service).

Exterior treatment of buildings in this category will include selective restoration and appropriate alteration. Interiors will be adapted to new uses.

Buildings in this category include: the granite shops and storehouses numbered 33, 34, 36, 38 and 75; the brick shops 42, 96, 103, 106, 107, and 114; the concrete warehouses 149 and 199; and buildings 266 (housing), 30 (Administration), 70 and 120.

- (3) Restoration: One building, the unique octagonal building known originally as the "Muster House," will be restored in its exterior appearance to the character which it had from 1871 to about 1940, when its first floor porch was removed and brick and concrete additions were constructed.

- (4) Demolition: Several structures are, by virtue of their placement, function, or visual character undesirable to retain and reuse. Buildings in this category include: Building 108 (the Power Plant) which is too inefficient by today's standards to keep in operation; Building 200, the DPW garage and fire station which by its placement

Table IV. J.2

Buildings to be Retained

<u>Building Number</u>	<u>Year Built</u>	<u>Previous Use</u>	<u>Potential Uses</u>
31*	1852	Telephone Exchange	Office, Retail, Restaurant
33*	1850	Enlisted Men's Qtrs.	Housing, Retail, Restaurant
34*	1837	Laboratory	Restaurant, Retail, Housing
36*	1866	Cafeteria	Restaurant, Retail, Housing
38*	1854	Post Exchange	Housing, Restaurant, Retail
39*	1863	Administration	Office, Art College
40 (facade)	1867	Ship Repair Shop	Housing
42*(portion)	1856	Machine Shop	Housing
58*	1834	Ropewalk	National Park, Other Exhibit
60*	1838	Tarring House	Arts/Crafts Studios
62*	1837	Ropewalk/Lab.	NPS Exhibit, Commercial, Retail
75*	1848	Storehouse	Art College, Retail
79*	1852	Storehouse	College
96*	1899	Boiler House	Office, Retail
103*	1903	Ship Repair Shop	Office, Retail
104 (portion)	1905	Ship Repair Shop	Housing, Art College
105*	1903	Chain Forge	Housing, Recreation
106*	1903	Boiler Shop	Museum, Art College
107*	1904	Public Works Shop	SPNEA
114*	1904	Carpenter's Shop	Office, Commercial, Housing
120*(portion)	1905	Dispensary	Art College
123*	1905	Pump House for Drydocks 1 and 2	Light Industry, Art College
131	1940	Flammable Storehouse	Art College, Office, Retail
149	1919	Warehouse	Pump House/Drydock 1
150	1920	Switching Station	Housing
199	1942	Storage	Parking
228	Unknown	Industrial Service	Switching Station
230	1957	Industrial Service	Parking
266	1825	Officer's Housing	Marina
			Marina
			Housing, Offices

* Buildings having mandatory priority for preservation.

Table IV. J.3

Buildings to be Demolished

<u>Building Number</u>	<u>Year Built</u>	<u>Previous Use</u>
36A	N.A.	Electrical Substation
42 (portions)	1857	Machine Shop
58 (addition only)	1943	Office Space
77	N.A.	Garage, Storage
104 (portions)	1905	Ship Repair Shop
108	1904	Power Plant
120	1905	Dispensary, Dental Clinic
127	N.A.	Incinerator
143	1917	Chapel
165	N.A.	Gas Cylinder Storage
178	N.A.	Lumber Storehouse
187	1919	General Warehouse
191	1932	Salt Water Cooling Pump House
191A	1932	Salt Water Intake Screen House
192	N.A.	Substation
192A	N.A.	Substation
193	1936	Storage
195	1938	Ship Repair Shop
196/227	1939	Ship Repair Shop
197	1941	Ship Repair Shop
200	1941	Fire Station
203	1942	Incinerator
206	1942	Office Building
207	1942	Decontamination Building
210	N.A.	Storage
211B	N.A.	Industrial Service Building
217	N.A.	Storage
218A	N.A.	Lumber Storehouse
225	1957	Pump Station
226	1957	Industrial Service Building/Substation
229	1957	Fire Pumphouse
231	1958	Switch Station
233	1958	Industrial Service Building
264	N.A.	Cooling Tower
268	N.A.	Ash Silo
271	1962	Paint Spray Building
274	N.A.	Substation
275	N.A.	Substation
277	N.A.	Oxygen Bottle Fill and Storage
278	N.A.	Substation
A	N.A.	N.A.
C	N.A.	N.A.
E	N.A.	N.A.
P	N.A.	Housing

N.A. = Information not available from B.R.A. records.

adjacent to Building 34 severely restricts the useability and marketability of that structure; Building 187, a shed warehouse of wood frame and corrugated metal sheeting, to facilitate circulation and reduce hazard adjacent to a noteworthy building, No. 75; Building 150 (sub station), to be demolished when its function is replaced; and Buildings 195, 197 and 104, which are outmoded and will be cleared in order to develop new community functions.

There are, as well, a number of minor freestanding buildings and additions to more substantial buildings which have been built over time of concrete block, brick, or wood or steel frame. In the process of selective restoration and rehabilitation, those which have little or no value, in terms of the criteria which have been proposed for evaluating such buildings, will be demolished.

In general, treatment of the exterior environment or "groundplane" could be categorized as rehabilitation - sidewalks and open areas will be treated in such a way as to be more conducive to pedestrian activity, but will be consistent with the historical and environmental character of the area. Physical and documentary evidence has provided visual evidence of written descriptions of earlier landscaping features and will be used as the basis for the choice of surface materials, type and location of trees or other plant materials, and street furniture. Selective restoration of certain features will be considered, as will the retention of representative elements of the industrial landscape such as crane tracks.

Impact of Modifications to the Property

Renewal activity in the Naval Shipyard will constitute one of the largest building recycling projects in the country. The predominant emphasis is on the retention and extended use of the historic elements of the Shipyard. Those modifications which will be made will have the effect of improving the visual and economic potential of the site as a whole and, therefore, its long-term viability.

More specifically, the effect of modifications will be to:

- (1) improve pedestrian and vehicular circulation within the area and improve connections to the rest of the Yard and outside;
- (2) reduce visual congestion and enhance the appearance and general attractiveness of the area (and, therefore, its marketability for new uses); and
- (3) clarify the essential architectural character of the most significant of the buildings in the area.

In the sense that all additions and alterations to a property over time are part of its history, the removal of certain of those additions and alterations can be seen as eliminating historic resources, however minor. In addition, since implementation of the proposed project will necessitate the removal of several buildings which are included, by virtue of their location within the Navy Yard, on the National Register of Historic Places, the project will have an irreversible, adverse impact.

However, the redevelopment proposals have been, and will continue to be, reviewed under the provisions of Section 106 of the National Historic Preservation Act of 1966, and Memoranda of Agreement will be executed to mitigate the adverse effects. The redevelopment plans, demolition proposals, and preservation approach for the Navy Yard also have been reviewed, and have been endorsed, by the Massachusetts State Historic Preservation Officer (see Appendix J.5).

Preservation in the surplus portion of the Shipyard will help to protect the "historic scene" or environment of the adjacent National Historic Site and should help to revitalize the residential areas of Charlestown, an historic community in itself.

If, as anticipated, the project is an economic success, excess income from leases over and above the monies needed to repay project costs and operating expenses will be used to assist other historic preservation and park projects in the City of Boston.

4. Impact of Alternatives

(1) "No-Build"

Under an alternative in which the General Services Administration were to lease the buildings in the Shipyard for warehousing or low-grade manufacturing, the initial effects on the buildings from a preservation standpoint would probably not be harmful - so long as

no clearance of buildings was effected in order to facilitate this use. However, in the long run, warehousing and low-grade manufacturing would result in inadequate maintenance of the buildings, might produce inappropriate changes to buildings (which would be difficult to control) and, by failing to produce adequate income generation, would not ensure the long-term economic viability of the site. Accelerated deterioration of the property most likely would result. In terms of providing continuity of use, warehousing would be almost as unrelated to the original manufacturing activity of the Shipyard as conversion to mixed residential, commercial and public institutional uses.

(2) Alternative Development Options

The alternative mixed-use developments vary to some extent in the degree to which the historic resources of the Shipyard would be affected, although in general the major structures of historic and architectural importance would be retained and probably similar preservation guidelines and controls as in the proposed development would be implemented. More intensive industrial use of the site, however, would require major changes to the site - reducing the overall density and improving access in order to make the site a modern, economically viable industrial facility. Although some of the buildings could be used for warehousing operations and light industrial purposes, the largest ship buildings have limited reuse possibilities for local industry. Thus intensive industrial reuse

would bring about its own set of physical changes to the historic character of the Shipyard. The mixed-use alternative adopted by the BRA for the Shipyard allows for the greatest degree of building retention combined with economic viability.

(3) Shipyard Reuse

From a preservation viewpoint, the shipyard reuse alternative, which would have kept the Naval Yard operation as a (private) shipyard, using the present facilities, would be ideal, being simply a continuation of its industrial character and function. However, the reasons which led to the Navy's decision to close the facility also caused private shipbuilders to ignore the Yard - it had become obsolete both in waterfront and in support facilities. Were the Yard to be used for long-term shipbuilding and repair, major modifications to the Yard and its buildings would be required which also would substantially change its historic character.

Part V

SUMMARY OF ALTERNATIVES AND THEIR IMPACTS

Part V SUMMARY OF ALTERNATIVES AND THEIR IMPACTS

Four alternative development/reuse proposals were evaluated to determine the environmental impacts of different levels of density and activity within the Charlestown Navy Yard. In brief summary, these alternatives include:

- (1) "No-Build" - leasing by the Government Services Administration of the existing facilities for general warehousing and low-grade industry.
- (2) Industrial/Institutional Option - reuse of 50 acres of the Shipyard for heavy manufacturing and marine-related industries, with institutional and commercial uses within the Historic Monument Area.
- (3) Housing/Industrial/Institutional Option - a mixed use development consisting of 500 units of housing, 28 acres of industrial land, a 400 room hotel, and reuse of the Historic Monument Area for museum, college, commercial, and office purposes.
- (4) Shipyard Reuse - conversion of the property to a private shipbuilding and ship repair facility.

These alternatives have been described previously in Part III of this Report (q.v.). A summary of the environmental impacts of each alternative, as evaluated in Part IV, follows.

(1) "No-Build"

Transportation

There would be minimal impact on the local and regional traffic circulation system. Traffic generated would be principally trucks making intermittent deliveries and pick-up and employee cars. Average daily traffic is estimated at 3,200 vehicles, with a p. m. rush hour traffic of 385 vehicles. No on-site parking would be provided for the National Park.

Air Quality

Only minimal changes in air quality would result, primarily from increased truck traffic. There would be no construction-related impacts since only the leasing of existing facilities is proposed.

Geology/Topography/Hydrology

There would be no impact on these natural features.

Water Quality

No change from existing conditions would be expected.

Biology

Lack of proper maintenance would result in a reversion of existing vegetation to a semi-wild state and an increase of weed species and probably of urban animal and bird life. The marine biology would continue to be adversely affected by land-based runoff and sewer outfalls.

Open Space/Recreation

There would be no provision for public open space or for waterfront access.

Public Utilities/Services

Minimal demands would be made for utility services, energy, and solid waste disposal. There would be no problem in providing the necessary services and resulting impacts would be significantly lower than those of the proposed project.

Noise

With no demolition or new construction, no construction-related noise impacts would result from this alternative. In the long-term, noise levels would remain essentially the same as current, the principal source being trucks entering and leaving the site.

Archaeology/History

Except possibly for the Ropewalk complex, no preservation guidelines would be enacted, and the lack of proper maintenance would cause a continued deterioration of the historic and architecturally-valued resources.

(2) Industrial/Institutional Option

Transportation

Considerably lesser traffic would be generated than with the proposed development - approximately 44% less. The proportion of trucks would

be expected to increase with greater industrial use and no housing, but no problems would be anticipated with the overall circulation system. A lesser added burden would be placed on the regional expressway system. Public transit demand, however, is estimated to be greater, making provision of adequate service even more critical.

Air Quality

Under this option there would be an increase in industrial emissions and potential adverse impacts on the local air quality, due to the concentration of industrial uses, especially heavy industry, retention of on-site power generation, and use of rail access. Construction-related impacts would be reduced considerably in magnitude, since this alternative would reuse more of the existing buildings. Traffic-related impacts also would be reduced somewhat, although there could be a greater amount of truck emissions.

Geology/Topography/Hydrology

Impacts would be generally the same as those of the proposed project; there would be little if any alteration of topography and no changes in groundwater levels.

Water Quality

Construction-related impacts would be substantially less. While no new pier construction would be proposed, existing piers in poor condition would be removed, temporarily increasing turbidity. In the long-term,

water quality would be adversely affected by any ship-related industrial activity, including potential oil spillage and other contamination. With little additional landscaping proposed, storm water runoff would equal that currently discharged from the site.

Biology

Only a minimal amount of new vegetation, primarily in the Historic Monument Area, would be provided. This option could adversely affect floral and faunal resources through increased air and noise impacts from the industrial operations. Marine resources also could be adversely affected from increased potential for pollution and greater turbidity.

Open Space/Recreation

Public open space would be limited to streets and small spaces in the Historic Monument Area. There would be no public park or waterfront access, since the industrial uses would completely cover the waterfront area.

Public Utilities/Services

The demand for utilities and services cannot be predicted with any accuracy since the specific nature of the proposed industry is not known. However, with extensive marine-related and heavy industry, water and electrical demands could exceed those of the proposed development. The existing power plant would be retained to provide power and steam to the Shipyard. Most of the utility systems could be reused with minimal

upgrading and repair, but the electrical system probably would require complete replacement. With minimal landscaping, storm drainage would be higher but would not exceed existing conditions. Solid waste generation could be greater and would differ significantly in composition, although there could be greater potential for recycling.

Noise

Some higher noise levels might be expected from the increased industrial use, retention of the power plant, greater proportion of truck traffic, and possible rail access. With minimal demolition and new construction, short-term noise impacts would be significantly less.

Archaeology/History

While the major structures of historic and architectural importance, particularly those in the Historic Monument Area, would be retained and protected by preservation guidelines, intensive industrial development of the greater portion of the property probably would require more extensive demolition to reduce overall density and improve access to make the site an economically viable industrial facility.

(3) Housing/Industrial/Institutional Option

Transportation

Lesser traffic would be generated than with the proposed project (13,850 vehicles vs. 18,780 vehicles). No significant impacts on the local or

regional circulation system would be expected nor would there be any capacity problems. Site-generated traffic would place a somewhat lesser burden on the existing capacity-restrained expressway system than the proposed project. The need for greatly improved public transportation linkages to the site would be as critical.

Air Quality

Construction-related impacts would not differ appreciably from those of the proposed project but would be reduced in magnitude since considerably less demolition and new construction would be proposed. Traffic-related impacts also would be reduced since traffic generation would be less, and no violation of air quality due to Shipyard generated traffic would be anticipated. Development-related impacts would be generally similar, although there could be a higher amount of industrial emissions with the increase in industrial space proposed.

Geology/Topography/Hydrology

Impacts would be essentially the same as those of the proposed project; there would be little or no alteration of topography and changes in groundwater levels.

Water Quality

Water quality impacts would be generally similar to those of the proposed project but lesser in degree. The temporary effects of marina construction

would be reduced considerably since less than half the number of slips would be proposed, which would also result in a lesser amount of potential pollution from operations. Storm water runoff would be somewhat greater since less of the site would be landscaped.

Biology

Impacts on biological resources would be generally similar, although a lesser amount of new vegetation and landscaped areas would be proposed. Impacts on the marine biology also would be similar but generally lesser in degree.

Open Space/Recreation

Public open space in this alternative would be reduced from 20 to 14 acres and would consist primarily of pedestrian ways and waterfront promenades, the piers, and some new spaces resulting from building demolition. There would be no large recreation space or waterfront park, but a 200 boat marina would be provided. All public open space would be available to the residents of Charlestown as well as tourists and site residents, and the waterfront would be opened up to public enjoyment.

Public Utilities/Services

Due to the less intensive overall development, utility and service demands would, in general, be reduced accordingly and would not place any burden on the public and private systems. Most of the existing utility lines in the Shipyard are in good condition and would require

only minor upgrading and repair work, although some new systems would be required. The electrical system in particular would require major repair or replacement. Storm drainage would probably be slightly higher since less of the site would be landscaped, but would not exceed existing conditions. Less solid waste would be generated.

Noise

Both short-term and long-term noise impacts would be essentially the same as those of the proposed project but would be lesser in magnitude, since construction activities and traffic generation would be reduced.

Archaeology/History

Major structures of historic and architectural importance would be retained and similar preservation guidelines and controls as in the proposed development would be imposed.

(4) Shipyard Reuse

Transportation

Traffic generated by conversion of the Charlestown Navy Yard to a private shipbuilding and ship repair facility would not significantly impact the circulation system nor result in any capacity problems. Total traffic generated, estimated at 7,580 vehicles per day, would be less than that of the proposed development program (which would produce the greatest amount of traffic) or of the alternative mixed-use proposal. A greater number of trucks could be expected. Improved public trans-

portation service for the employees would be required. This alternative would not provide any on-site parking facilities for the National Park.

Air Quality

With nearly total reuse of existing structures, there would be minimal construction-related impacts on the ambient air quality. In the long-term, however, air quality would be substantially impacted from intensive industrial use, retention of the power plant, reestablishment of rail service, increased truck traffic, and inberth vessels. Adverse impacts on adjacent residential areas and the National Park could be anticipated.

Geology/Topography/Hydrology

There would be minimal if any impact due to the reuse of existing structures and facilities for the same purposes as originally designed.

Water Quality

This option would have a significantly greater adverse impact on water quality. Normal oil discharge from large vessels docking and leaving the facility and the greater potential for spillage would increase contamination of the Harbor, as would the shipbuilding and repair activities, which could discharge chemicals, metal particles from abrasive blasting, paint scraps, etc. Surface runoff would equal that currently discharged from the site.

Biology

The existing plant and animal life probably would be adversely affected by the extensive industrial use, although most of the vegetative resources are physically removed from the more intensive industrial area. The marine environment also could be adversely affected by the potential for increased water pollution levels and greater turbidity.

Open Space/Recreation

There would be no opportunity for public open space or waterfront access under this alternative.

Public Utilities/Services

While the demand for utilities and services probably would exceed that of the proposed project, it could be adequately met since the scale of activity would be considerably less than that approached during World War II. No burden on existing water and sewer facilities would be expected. The power plant would be retained to provide for the energy and heating requirements, and the existing utility services would require selective upgrading or complete replacement.

Noise

Short-term noise impacts would be minimal, but in the long-term the ambient level would increase considerably from the industrial activity, rail usage, and greater truck volumes. Higher noise levels could adversely impact residential areas and the National Park.

Archaeology/History

This alternative would, from a preservation standpoint, be the most ideal since it would continue the original industrial character and function of the Shipyard. However, because of the obsolescence of many of the buildings and facilities, reuse of the Navy Yard for shipbuilding and repair would require major modifications to the Yard and its buildings, which would substantially change its historic character.

Part VI MEASURES TO MINIMIZE ENVIRONMENTAL DAMAGE

Part VI MEASURES TO MINIMIZE ENVIRONMENTAL DAMAGE

The proposed redevelopment of the Charlestown Navy Yard could result in potential adverse impacts on the physical environment in both the short-term and long-term. Through the implementation of mitigation measures described below, these impacts can be minimized so as not to cause any permanent environmental damage.

1. Short-Term Mitigation Measures

The major adverse impacts identified for this project for the short-term, construction period include the temporary effects of increased levels of air pollution and noise, the accumulation and disposal of debris and solid waste, the effects of construction-related truck traffic on the local community, and potential harm to water quality from marina and other harborside construction and increased pollutants in surface runoff.

To minimize the impacts of air pollution and excessive noise generation, contract documents will require that all construction work be done in compliance with the City of Boston and Commonwealth of Massachusetts air and noise pollution regulations. City of Boston regulations are contained in the "Regulations for the Control of Atmospheric Pollution," adopted under the provisions of Section 31C, Chapter 111, Massachusetts General Laws, and in the "Regulations for the Control of Noise in the City of Boston," adopted under authority granted in Chapter 40, Section 21, of

the General Laws; both of these regulations are enforced by the City of Boston Air Pollution Control Commission. Massachusetts regulations are contained in the "Regulations as Amended for the Control of Air Pollution in the... Metropolitan Boston Air Pollution Control District..." adopted under the provisions of Section 142D, Chapter 111, of the General Laws, and enforced by the Bureau of Air Quality Control. Pertinent sections of these regulations, relating to construction activities, are attached in Appendix K. To implement these regulations, specific control measures, as described below, can be utilized.

Air Quality

The most significant air quality impact during the construction period would be substantial increases in the amount of particulate matter, or fugitive dust, released into the atmosphere as a result of building demolitions, loading of rubble and excavation material into trucks, land clearance, excavation, and grading, and cut-and-fill operations. During demolition, dust levels can be reduced significantly, by as much as 80%, with the use of extensive or continuous wetting (use of water spray) throughout the demolition and rubble-removal process. Average control (intermittant wetting, with the most intense wetting occurring during the actual razing of a structure) can result in a 50% reduction of dust generation.

Fugitive dust from land clearance, grading, and excavation activities can be controlled by watering down of the exposed ground area and by chemical stabilization methods, such as the application of calcium

chloride. According to EPA studies, twice daily watering with complete coverage can reduce dust emissions by up to 50%. Chemical stabilization, which is not effective in reducing dust generation caused by construction equipment traffic on exposed ground or by actual excavation and cut-and-fill operations, may be used most effectively on completed excavations or graded sites. However, chemical stabilization may be costly, contaminate the treated soil, and have adverse impacts on plant and animal life.

To control dust from trucks loaded with demolition debris or excavated material, and to reduce spillage on city streets, all trucks should be sprayed when necessary and loads should be covered.

Air pollutants also will be emitted by gasoline- and diesel-powered construction equipment and trucks operating on the site. These emissions can be reduced by restricting the idling of trucks and equipment when not in use.

Should asbestos material be present in any of the buildings to be demolished, contract specifications will require strict compliance with EPA regulations (National Emission Standards for Hazardous Air Pollutants) published in the Federal Register, Part II, April 6, 1973, and amended May 3, 1974 (39 FR 15396), to prevent the emission of friable asbestos material.

Noise Levels

Noise levels of demolition and construction equipment can be reduced considerably by the use of commercially-available muffled equipment and by the installation of mufflers and housing on existing equipment. EPA studies have indicated possible reductions of from 1 to 18 dB(A), depending on the piece of equipment and the type of control used (see Tables VI.1 and VI.2). Other studies indicate even further reductions are possible by using state-of-the-art abatement equipment, including a significant reduction in noise emitted by pile drivers, one of the loudest pieces of construction equipment which will be used on the site (see Table VI.3).

Other mitigation measures that can be employed to reduce excessive noise generation from construction activities include: (1) selecting the quietest of alternative items of equipment (e.g., hydraulic tools instead of pneumatic impact tools), (2) replacing individual operations and techniques by less noisy ones (e.g., using welding rather than riveting), (3) turning off idling equipment, and (4) scheduling equipment operations to keep average noise levels low, to keep noise levels relatively uniform in time, and to have the noisiest operations coincide with times of highest ambient levels.

Solid Wastes

To minimize the impacts of demolition and construction debris to be generated by this project, all contractors will be required to remove all solid wastes from the site and to dispose of it at disposal sites

TABLE VI.1: NOISE CONTROL FOR CONSTRUCTION EQUIPMENT¹

<u>Source</u>	<u>Control Techniques</u>	<u>Probable Noise Reduction in dBA)*</u>
Engine		
exhaust	improved muffler	10
casing	improved design of block enclosure	2 10
fan (cooling)	redesign silencers, ducts and mufflers	5 5
intake	silencers	5
Transmission	redesign, new materials enclosure	7 7
Hydraulics	redesign, new materials enclosure	7 10
Exhaust		
(pneumatic)	muffler	5-10
Tool-Work		
interaction	enclosure change in principle	7-20 10-30

*Note that noise reductions are not additive. Incremental reductions can be realized only by simultaneous quieting of all sources of equal strength.

¹U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances (NTID 300.1), Dec. 31, 1971.

TABLE VI.2: IMMEDIATE ABATEMENT POTENTIAL OF
—CONSTRUCTION EQUIPMENT¹

Equipment	Noise Level in dB(A) at 50 ft		Important Noise Sources ²	Usage ³
	Present	With Feasible Noise Control ¹		
Earthmoving				
front loader	79	75	E C F I H	.4
backhoes	85	75	E C F I H	.16
dozers	80	75	E C F I H	.4
tractors	80	75	E C F I W	.4
scrapers	88	80	E C F I W	.4
graders	85	75	E C F I W	.08
truck	91	75	E C F I T	.4
paver	89	80	E D F I	.1
Materials Handling				
concrete mixer	85	75	E C F W T	.4
concrete pump	82	75	E C H	.4
crane	83	75	E C F I T	.16
derrick	88	75	E C F I T	.16
Stationary				
pumps	76	75	E C	1.0
generators	78	75	E C	1.0
compressors	81	75	E C H I	1.0
Impact				
pile drivers	101	95	W P E	.04
jack hammers	88	75	P W E C	.1
rock drills	98	80	W P E	.04
pneumatic tools	86	80	P W E C	.16
Other				
saws	78	75	W	.04
vibrator	76	75	W E C	.4

Notes:

1. Estimated levels obtainable by selecting quieter procedures or machines and implementing noise control features requiring no major redesign or extreme cost.

2. In order of importance:

- | | |
|---|-------------------------|
| T Power Transmission System,
Gearbox | 7 Cooling Fan |
| C Engine Casine | 4 Tool-Work Interaction |
| E Engine Exhaust | H Hydraulics |
| P Pneumatic Exhaust | I Engine Intake |

3. Percentage of time equipment is operating at noisiest mode in most used phase on site.

¹ U.S. Environmental Protection Agency, Noise from Construction Equipment Operations, Building Equipment, and Home Appliances (NTID 300.1), Dec. 3

Table VI.3

Result of noise mufflers and acoustical enclosures on construction equipments and tools now in use (partial list). 1

<u>Equipment</u>	<u>Device</u>	<u>Before</u>	<u>After</u>	<u>Distance</u>
<u>Pile Driver</u>				
Vulcan 010	none	103 dBA		25 ft.
	muffler on exh. & sound barrier on the loads		85 dBA	25 ft.
<u>Paving Braker</u>				
Ingersoll-Rand Model SB-8	none	105 dBA		3 ft.
	muffled		100 dBA	3 ft.
	muffled		85 dBA	50 ft.
	plus acous. enclosure		75 dBA	25 ft.
<u>Diesel Drive Electric Welding Machine</u>				
Lincoln Co. Model 400	none	93 dBA		23 ft.
	muffler and plus acous. enclosure		76 dBA	23 ft.
<u>Air Compressor - (Diesel Driven)</u>				
Ingersoll-Rand 1200 CFM	none	105 dBA		3 ft.
	muffled		85 dBA	3 ft.
Gardner-Denver 750 CFM	none	103 dBA		3 ft.
	muffled		85 dBA	3 ft.

approved by the Commonwealth of Massachusetts, Department of Environmental Quality Engineering. The disposal of spoil material in the Commonwealth is governed by the Massachusetts Sanitary Landfill Regulations, approved and adopted by the Department of Public Health, April 13, 1971, and by Massachusetts General Laws, Chapter 111, Section 150A, as well as by other regulations. In accordance with State law, no on-site burning of debris will be allowed. To reduce the amount of debris requiring disposal, recycling efforts can be encouraged. It is anticipated that, as is the frequent practice, bricks and other material from building demolitions will be sold for recycling and wood and steel structural members and other metal will be sold for reuse or scrap.

Transportation

Adverse impacts from construction and demolition truck traffic, including noise generation and air contamination, can be minimized by the careful routing of such traffic to avoid residential areas and other sensitive receptors.

Water Quality

During the construction period, water quality will be impacted chiefly from increased amounts of suspended solids in the surface runoff due to erosion and siltation from land clearance and excavation and by increased turbidity of the Harbor waters from pier demolition, pile removal, and marina construction. The anticipated increase in the suspended solid load, however, is not expected to be significant and in any

Air-tracked Drill

Ingersoll-Rand

600 CFM

none

104 dBA

23 ft.

acous. enclosure

83 dBA

23 ft.

Gardner-Denver

none

104 dBA

23 ft.

muffled

100 dBA

23 ft.

plus acous.
enclosure

77 dBA

23 ft.

Chain Saw

Gasoline Driven

none

113 dBA

3 ft.

Elec. Driven

none

86 dBA

3 ft.

72 dBA

15 ft.

¹ Final Environmental Impact Statement, East 63rd Street Subway Line, New York City Transit Authority, April 1973.

case would be minimized since the ratio of the volume of the discharge water to the volume of the receiving water (Inner Harbor) would be extremely small. Water turbidity also will be minimized in the construction of the marina since no dredging currently is anticipated to be necessary.

To prevent further potential for water pollution, all used oil resulting from on-site truck and heavy machinery utilization should be collected and properly disposed of off-site. Stockpiling and storage of construction material and of excavation and demolition waste should be located at a distance from the edge of the water to minimize the danger of pollutants reaching the water through runoff. In addition, all sanitary wastes generated during the construction phase should be collected in chemical toilets and properly disposed of by the contractors, or trailer toilets should be connected into the new on-site sanitary sewer system when installed.

2. Long-Term Mitigation Measures

Several specific mitigation measures also can be employed to insure that the Charlestown Navy Yard redevelopment project, when completed and in full use, will have minimal impact on the physical environment.

Air Quality

Assuming presently-scheduled implementation of the Boston Transportation Control Plan and the Federal Motor Vehicle Control Program regulations,

traffic generated by this project is not anticipated to result in any degradation of local air quality or prevent the maintenance or attainment of national air quality standards. Although violations of standards are expected at City Square, these would be a consequence of the existing circulation characteristics of the Square and not of added traffic from the Navy Yard redevelopment, which, in any case, would be insignificant. Implementation of proposed traffic improvements at City Square would help to reduce congestion and thus the excessive pollution. In addition, the construction of the proposed Chelsea-Water Streets Connector will direct trucks and Shipyard-related traffic away from adjacent residential areas, minimizing the potential for any adverse impacts on concentrations of population.

Excessive dependence on automobile usage by site residents and visitors can be minimized by providing frequent and efficient public transportation service to the Shipyard site, or by initiating service which currently does not exist. The establishment of direct bus (or rail) linkages to the Community College rapid transit station and to downtown Boston would be particularly critical to satisfy the projected demand. Also, the development of a water taxi ferry service linking the Shipyard to downtown and other points, as well as shuttle bus service between the National Park and the other historic sites in Boston, could further reduce the need to use the private automobile. Implementation of these proposals not only would help to prevent potential deterioration of local air quality from vehicular traffic but also would reduce the amount of potential site generated traffic to be added to the Charlestown street and regional expressway systems.

Although development-related impacts from any on-site fossil-fuel generated heating systems, garage ventilation, and industrial emissions cannot be predicted with any accuracy at this time, any potential adverse effects would be mitigated by compliance with applicable State and/or Federal permit regulations. All fuel burning equipment rated at 3.0 million BTU/hour or greater will require a permit from the Massachusetts Bureau of Air Quality Control, and the Department will not issue a permit unless satisfied that no adverse air quality impacts will occur. However, total use of electricity for the development's heating and energy requirements would eliminate the need for any on-site fuel burning equipment (total electrical use for the new housing development is currently under consideration). Care will be taken in the location of garage intake and exhaust fans to minimize or avoid any adverse impacts on adjacent buildings or concentrations of population.

Noise Levels

Minimal long-term noise impacts are expected to result from the proposed redevelopment. Modelling studies indicate that noise levels from vehicular sources will not be excessive nor be significantly greater than existing conditions. The major noise source from the project (other than motor vehicles) will be outboard-powered motor boats (estimated at 20-25% of the 550 berthing spaces). Although noise from this source (which can be as high as 95 dB(A)) can be reduced by use of the quietest motors commercially available, it should be noted that at the present time the City of Boston does not have any regulations specifically controlling motor boat noise nor has the EPA promulgated any regulation for new motor boat engines.

Building mechanical systems (air conditioning equipment, exhaust fans, etc.) are a second potential noise source within the project. Such impacts can be mitigated by design and location to meet or exceed applicable noise level criteria and by the selection of equipment producing noise as low as current available technology allows.

Adverse external noise impacts have been mitigated by the siting of the project's major noise-sensitive receptors - the new housing, the public park, and the hotel center - on the waterfront side of the Shipyard, away from the noise intrusion of the heavy traffic on the Tobin Bridge. In certain areas of the project site, however, where existing and future noise levels exceed normally acceptable criteria (e.g., the new housing site in the Historic Monument Area), appropriate sound attenuation measures in the architectural treatment of the buildings, such as the use of double-glazed windows, will be required to reduce adverse effects.

Transportation

The principal adverse traffic-related impact identified for the proposed project is a potential capacity problem at Gate 4, one of the two main entrances into the project area. Assuming a predicted 50-50 split of traffic between Gates 4 and 5, a demand approximately 25% in excess of capacity could result at the intersection of Gate 4 with Chelsea Street during the p.m. peak hour. To mitigate this problem, three relatively simple measures can be implemented: (1) prohibition of left-turns from

Chelsea Street westbound into Gate 4, (2) a minor widening of Chelsea Street at Gate 4 to provide a left-turn lane, and (3) management controls to emphasize the use of Gate 5 for Navy Yard traffic destined to and from the parking facilities.

Based on street capacity analyses, site-generated traffic is not expected to cause any capacity problems on the local street system.

Construction of the proposed Chelsea-Water Streets Connector (expected to be in operation by 1980) will provide an adequate route to and from the Navy Yard and will direct the heavy volume of site-generated traffic away from adjacent residential areas. Shipyard traffic will, however, add minimally to the burden of the already capacity-restrained expressway system as well as to the presently congested City Square area.

These problems will be mitigated, if not entirely eliminated, by future improvements under design for City Square and for the possible depression of the expressway system through Charlestown. In addition, the provision of adequate public transportation service to the Shipyard could help to reduce vehicular usage by the site's residents and visitors. It is expected that the MBTA will establish direct bus service as development proceeds.

Water Quality

To reduce adverse water quality impacts following completion of the proposed Navy Yard redevelopment, storm drainage and runoff from the site will be channeled into catchment basins to separate suspended solids and other pollutants prior to discharge into the Harbor. Siltation

should occur in the catchment basins, which should be cleaned periodically to reduce the amount of particles reaching the water. In addition, the provision of extensive additional open space and landscaped areas should further help to reduce the amount of polluted runoff that would enter the surrounding waters, as would a concerted program for street cleanup.

Contamination of surface runoff in the form of fecal coliform can be reduced or eliminated by restricting or prohibiting altogether dogs and other pets from the project development.

The adverse impacts of normal oil discharge into the Harbor from motor-powered vessels can be mitigated by management policies which encourage the use of sailing vessels rather than motorboats in the marinas. It is presently estimated that approximately 20% to 25% of the boats docked at the site will be motor-powered. No disposal of oil will be permitted at the site. In addition, the discharge of untreated sanitary sewage from boats will be controlled by recently-enacted EPA regulations (41 FR 4451, January 29, 1976).

Although no decision has yet been made on fuel storage at the site, adverse effects from any such facility can be minimized through proper design of the facility and by the control of the use and storage of petroleum products on-site to prevent spillage or leakage. Construction and operation of the marinas themselves will require approvals and permits from the U.S. Army Corps of Engineers, the Boston Conservation

Commission (pursuant to MGL Ch. 131, s. 40), and the Massachusetts Department of Environmental Quality Engineering (pursuant to MGL, Ch. 91). These permits, and any conditions attached thereto, should include measures that can be taken to ensure that the proposed marina construction will not result in any impairment of the area's water quality.

Potential water damage due to the location of the site in a Flood Hazard Area will be minimized through compliance with City of Boston and Federal regulations governing development in a flood hazard district and by proper design of the structures.

Historic Resources

In order to reduce potential adverse impacts to the significant architectural and historical resources of the Shipyard, general design guidelines, consistent with the "Basic Guidelines for the Rehabilitation of Historic Property" of the National Park Service, have been developed for the treatment of buildings in the Yard and their external environment. These guidelines, which will serve as the basic framework for future decisions on the development of the Yard, will be supplemented by specific design standards to be developed for each building or group of buildings and for the treatment of the groundplane. These guidelines and controls are further detailed in Section J of Part IV. In addition, continual review of all proposals for demolition, new construction, and rehabilitation by the State Historic Preservation Officer (pursuant to Section 106 of the National Historic Preservation Act of 1966) should assure the preservation of the historic character and architectural

Commission (pursuant to MGL Ch. 131, s. 40), and the Massachusetts Department of Environmental Quality Engineering (pursuant to MGL, Ch. 91). These permits, and any conditions attached thereto, should include measures that can be taken to ensure that the proposed marina construction will not result in any impairment of the area's water quality.

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Furthermore, careful and detailed consideration of all reuse possibilities for buildings proposed for demolition should be undertaken prior to their removal to ensure maximum possible preservation of existing structures within the site consistent with current market and economic conditions.

Although no archaeological resources are known to exist on the site, the possibility of their presence cannot be overlooked. To minimize the loss of any such material if encountered during the site clearance and excavation stages, it is recommended that procedures be established to provide for prompt reporting of items of archaeological interest uncovered and to terminate work until a qualified archaeologist can assess the value of such resources and ensure their proper removal and preservation.

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